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of the

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EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

LIEUTENANT-COLONEL C. J. COPPINGER, R.A.M.C.

MANAGER.

MAJOR S. W. KYLE, R.A.M.C.

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Original Communications.

INVESTIGATION OF PULMONARY CONDITIONS BY LIPIODOL.

By MAJOR A. G. BIGGAM, O.B.E.
Royal Army Medical Corps.

THE technique of administration of lipiodol is simple and the information obtained from its use has proved of the very greatest value in certain pulmonary conditions where the diagnosis has been in doubt.

COMPOSITION AND LOCAL EFFECTS ON THE TISSUES.

Lipiodol is a compound of iodine in poppy-seed oil and contains 40 per cent iodine. It is a clear amber-coloured fluid when fresh, but tends to darken after being exposed to light for a long time and should then not be used.

The iodine contained in it renders the oil opaque to X-rays, and so after injection its position in the tissues can be demonstrated by the radiologist.

The iodine is actually in combination with the unsaturated oil and so has none of the irritating action on the tissues that one associates with the presence of free iodine. It does not stain the skin, and can be injected anywhere in the body without producing local irritating effects. It has been used intramuscularly and intrathecally, and, even in the latter situation, the oily compound is usually found to produce no local irritative symptoms. I have, however, observed on two separate occasions some pain complained of in the lumbo-sacral region, due to the collection of the lipiodol there in patients when the injection was made by cisternal puncture for the elucidation of obscure spinal conditions. The pain, however, was of short duration, and after a couple of days or so entirely disappeared. In pulmonary cases after injection into the trachea this heavy oily compound spreads down and lines the trachea, bronchi, bronchioles,

and eventually the alveoli. An X-ray will then be able to demonstrate the size and condition of the various parts of the air passages outlined by this radio-opaque substance.

The oil is removed from these situations chiefly by expectoration, but a little of it remains in the lung and is dissociated by the pulmonary tissue, the iodine then being got rid of chiefly by the kidneys. The rate at which the lung is rendered free from the lipiodol varies; in some cases very little opacity remains after a few hours, but one has occasionally observed its presence in considerable quantities even as long afterwards as a fortnight.

There is practically no danger attached to the injection, even when the operation is carried on very carelessly and the oil allowed to flow into the peritracheal tissues. I have observed a case where practically the whole of the injection had been made into these tissues and was demonstrated there by X-rays. The patient, however, complained of no discomfort, the oil gradually extending down the tissues into the mediastinum and eventually becoming absorbed with no ill-effects to the patient.

It has been stated that ill-effects may result from the administration in cases of pulmonary tuberculosis, but I have not observed any injurious results after its use in such cases. It appears to me, however, inadvisable to employ it in cases with a history of recent hæmoptysis, for in these cases the residual oil, after dissociation, may possibly cause sufficient disturbance to lead to a recurrence of the hæmorrhage. Such occurrences have been noted by me, but in cases like this it is always difficult to decide whether the hæmorrhage has recurred as a result of the injection, or merely in the ordinary course of events.

In cases of bronchiectasis the patient states, not infrequently, that he is much relieved by the injection, and I have had patients make repeated requests for further injections owing to their having experienced relief from the previous administration.

The sputum in many cases is definitely diminished for some days following, but I have occasionally observed the quantity to increase, even up to as much as double the amount, for a few days after the injection.

It is well to warn the patient that after the injection the sputum coughed up should be spat out and not swallowed so as to get rid of the iodine from the system. I have, however, not infrequently observed opacity caused by the oil lying in the stomach, this having been swallowed after being coughed up, but apart from an occasional slight iodine coryza no ill-effects have ever resulted from this in my series of cases.

Information Obtained by Lipiodol Injection.

Very valuable information is obtained by X-ray examination after the injection. It will show the outlines of the trachea and bronchi, and any compression or obstruction there will be visualized, likewise any dilatation of the bronchi or cavity formation in the lung parenchyma communicating with the bronchi will be demonstrated.

Indications for its Use.

The common lung conditions in which most assistance may be expected are those associated with chronic cough and expectoration. The clinical signs in this type of case are often very indefinite and ordinary X-ray examination may not help very much in elucidating the underlying condition, which may vary from an ordinary chronic bronchitis to pressure causing obstruction to the air-passages due to masses of glands or a tumour. In such cases lipiodol injection followed by X-ray examination will often clear up the problem at once.

The differentiation between chronic bronchitis and bronchiectasis is often impossible without lipiodol injection, for the latter condition may exist without any of the typical symptoms, such as paroxysmal cough and profuse expectoration.

There may be only a history of cough with slight expectoration, and physical examination may not reveal any signs of dilatation of the bronchi, which may be too far from the surface to produce recognizable physical signs. In such a case lipiodol may demonstrate even quite large cavities which had escaped detection even after repeated clinical examination.

Where the diagnosis of bronchiectasis is in no doubt whatever, and the question of operation is being considered, the injection is also essential to confirm one's clinical findings that the condition is unilateral and the case therefore suitable for operative treatment by phrenic avulsion, thoracoplasty, lobectomy, etc.

In bronchiectasis it is essential that the patient should carry out postural coughing prior to the injection so as to empty the dilated bronchi of secretion. Obviously, if they are already full of thick contents, the lipiodol will float on top of this viscid substance and not enter the cavities in the same way as if care had been taken to have them emptied prior to the injection. The emptying is also important from the point of view of diminishing the tendency to cough after the injection has been made until the radiologist has had an opportunity of obtaining the necessary pictures of the lung with the oil *in situ*.

Methods of Carrying out the Injection.

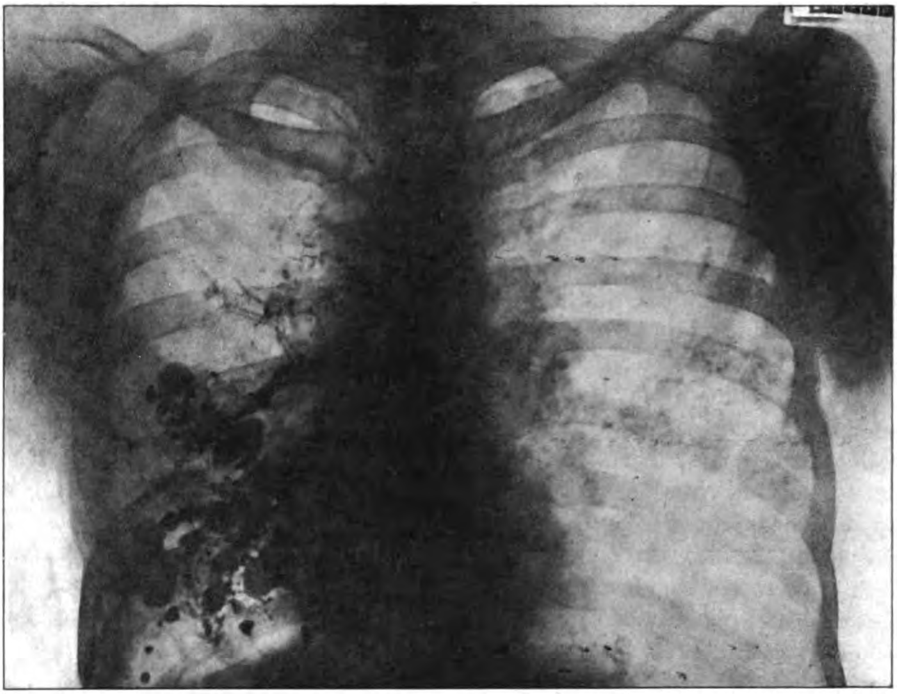
No special skill is required to enable one to carry out the injection, and the assistance of the surgeon should not be necessary, the operation being carried out by the physician, either in the ward, or, if this is not conveniently situated to the X-ray room, it can be done actually in the X-ray department.

There are various methods of getting the oil into the air passages, but the one I have used most extensively has been injection by the crico-thyroid route. The patient, if nervous, should have a preliminary injection of morphia one-sixth grain half an hour beforehand. He should be propped up by pillows in the semi-sitting position with the head supported in the extended position by pillows and kept in the middle line. This ensures

that the structures on the anterior aspect of the neck will be kept on the stretch and less liable to slip about during subsequent manipulation.

The surface having been prepared, the skin and subcutaneous tissues down to the cricothyroid membrane are anæsthetized by half per cent novocain, using only a very little anæsthetic so as not to obliterate the landmarks.

The next step is to inject some cocaine inside the larynx so as to anæsthetize the structures inside and thus render them less sensitive. This is done by using a two-cubic-centimetre syringe with a stoutish needle, containing 10 minims of a five per cent solution of cocaine.



The cricoid cartilage is fixed between the thumb and index finger of the left hand, and the needle inserted above the cricoid cartilage at right angles to the surface and pushed through the tissues till it is felt to slip through the membrane into the underlying air passage. It is always easy to recognize when this has happened.

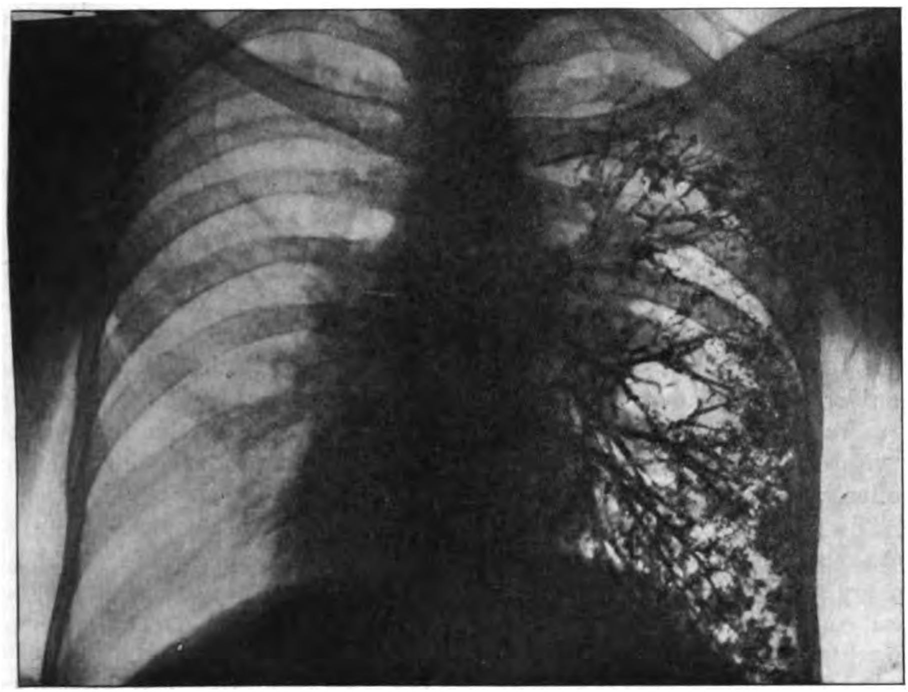
The piston of the syringe having been withdrawn to suck in some air and so ensure that the point is free in the air passage, the cocaine is quickly injected and the needle withdrawn at once. Coughing will be induced by the contact of the cocaine with the sensitive mucous membranes and this will assist in spreading the local anæsthetic over the required area. The next step is the actual injection of the lipiodol, and here there is one most

important point to be considered, that is the consistency of the oil. It is a thick viscid substance and consequently difficult to get to run through an ordinary fine-bore needle.

The only difficulty I ever experienced in my early cases was that of forcing the oil through the available needle. This was a very real difficulty until we procured a suitable needle.

The needle must be one with a wide bore, and there is now available a suitable one devised by Chandler (a trocar and cannula), the cannula fitting an ordinary ten-cubic-centimetre Record syringe.

We actually used, and still use one devised by my Registrar, Dr.



Mohamed Ibrahim, consisting of a lumbar puncture needle cut down to about two centimetres long so as to be more easily controlled and not so liable to scratch the posterior wall of the air passage after having penetrated the anterior wall. This needle fits a ten-cubic-centimetre Record syringe and has a good wide bore which allows the oil to flow readily.

The oil will flow much more easily if it is kept warm by immersing the vessel in which it is contained in very hot water, and if the syringe used for the injection is also warmed immediately before sucking up the oil.

The needle is inserted through the cricothyroid membrane in the same way as for the injection of the cocaine, and here there may be slight difficulty in getting it to penetrate the skin. It has been recommended that a

small incision be made in the skin to facilitate the passage of the needle, but this seems to me unnecessary and undesirable.

The needle having penetrated the cricothyroid membrane, the syringe containing the oil is attached and the piston withdrawn a little to allow bubbles of air to enter and so demonstrate that the point is in the correct position, free in the air passage. The piston is then pressed slowly home and the oil gradually injected; the syringe will have to be detached for refilling until the required amount (twenty to thirty cubic centimetres) has been injected. It is advisable to verify the position of the point of the needle occasionally during the injection by sucking up a few bubbles of air.

The patient should be asked to refrain from coughing or swallowing during the injection, and to breathe quietly through the nose.

Usually no interference with respiration is experienced, even when as much as thirty cubic centimetres of oil are used.

The position of the patient after the injection will vary according to the area of the lung requiring investigation. The position and size of the right bronchus is such that, if the position of the patient be not changed after the injection, most of the oil will find its way into the right base.

Where the left lung is to be filled, the patient should be tilted towards that side after having inserted the needle, and before commencing the injection.

If the apex is the suspicious area, the patient should have his head and shoulders lowered about two minutes after the completion of the injection so as to allow the oil, having passed the bifurcation of the trachea, to gravitate to the apex which has now become the most dependent part of the lung.

The patient should be kept in the required position for about ten minutes and then photographed in the supine and the erect position. He should, as already stated, be asked to refrain from coughing till the examination has been completed, and also when he does cough to spit out the material brought up and so avoid swallowing the iodine compound.

Valuable information is occasionally obtained by getting the patient to cough after the photographs have been taken and then taking another picture. By this means lipiodol may be forced into areas of the lung that previously had not been filled.

Close on 100 cases under my care have been investigated by the aid of lipiodol, and no difficulty has been experienced in carrying out the above technique, and in many of these cases very great assistance has been obtained in arriving at a correct diagnosis.

Other routes for the injection have occasionally been tried. At first I made the injections into the trachea below the cricoid cartilage instead of through the cricothyroid membrane, but this position did not seem to have any advantages over the higher situation, and the trachea was found to be less easily fixed and controlled than the structures above the cricoid.

I have also administered it by the mouth in quite a number of cases, and this route has the advantage, from the physician's point of view, of greater simplicity, and from the patient's point of view entire absence of all idea of anything in the way of a surgical operation.

In carrying out this method I have used an ordinary glass urethral syringe with about three inches of rubber tubing attached to the nozzle. The patient sits in a chair with the head forward and the tongue protruded and held out by hand. The warmed oil is slowly injected, the end of the tubing being kept near the base of the tongue, between that and the uvula, and not touching either so as to avoid inducing retching. The patient should breathe deeply during the time the oil is being injected, and must refrain from swallowing. The tongue should be kept protruded during the whole period the oil is flowing. If the co-operation of the patient is obtained during this simple injection, all the oil will run into the larynx, and any part of the bronchial tree can thus be visualized quite as well as by any of the previous mentioned methods in which needles have to be used. This method has proved highly satisfactory in quite a number of cases investigated by us.

Lipiodol can be obtained in two-cubic-centimetre ampoules or in bulk, the latter form being less expensive and quite satisfactory for carrying out long examinations.

A satisfactory English preparation is now on the market.

Commentary.

(1) Lipiodol injections have been found to be of the greatest value in the elucidation of many obscure lung conditions.

(2) Its use is essential in cases of bronchiectasis, where, from clinical examination, the condition is considered to be unilateral and operative procedure is being contemplated for collapse or for other surgical methods of treatment of the diseased lung.

These clinical findings should always be confirmed by lipiodol injection, followed by an X-ray examination, to see the exact extent of the disease in the affected lung and to exclude the presence of any commencing trouble on the other side.

(3) There is practically no danger attached to the procedure even when it is carried out carelessly, and some of the oil is injected into the peritracheal tissues.

(4) No ill-effects have been observed by us after administration in cases of subacute and chronic pulmonary tuberculosis.

(5) The only type of case in which we still use lipiodol with caution is one with a history of recent hæmoptysis, since the dissociation of the compound in the lung may possibly tend to produce local irritation and a recurrence of the hæmorrhage.

(6) The cricothyroid route has been found by us to be the most generally satisfactory, the procedure being very simple and easily carried out if the difficulty of the thick consistency of the oil is overcome by previous warming and using a large-bore needle.

The oral method has also proved satisfactory, and has the advantage of extreme simplicity.

The radiological work entailed in these investigations was carried out under the supervision of Dr. Gardner, Director of the Radiological Department, Kasr el Aini Hospital, and the two pictures produced on pages 4 and 5 were also kindly supplied by him.

HERDS AND INDIVIDUALS.[1]

By Surgeon-Commander SHELDON F. DUDLEY, O.B.E., M.D., M.R.C.P., D.P.H., D.T.M., R.N.

Professor of Pathology and Lecturer in Tropical Diseases, Royal Naval College, Greenwich.

The term "herd" as a prefix to denote properties of a community, or group, as distinct from similar properties of the individual members of the group, was first popularized by the psychologists with the phrase "herd-instinct." Topley, I believe, was the first to use the word to describe physiological and pathological qualities of the community. He coined the term "herd-immunity" to express the resistance of a population to the spread of epidemic disease in contradistinction to the sum of the individual resistances of the members of the group. In some quarters the term "herd" has been criticized as out of place when applied to human beings. However, since the time of Huxley, it has been realized that there are no significant anatomical differences between man and the higher primates, and recent studies, in human and other animal behaviour, indicate the mental differences are quantitative rather than qualitative. But, unfortunately, just about the time that the new Adam looked round his garden to re-name the animals in it, he was beginning to think he had found out most of Nature's secrets; also, since he had for centuries believed he was created in God's image, he felt justified in calling himself *Homo sapiens*. To-day, I think, the new Adam is more modest and would have been more likely to suggest *ignoramus*, or at least *inquirens*, as his specific designation, and left *sapiens* for a future product of evolution. Because, although it is absurd to pretend that man has found out nothing from the mass of facts and observations he has accumulated in recent years, yet he is getting a glimmering idea that, before he can expect an answer to many of the questions he is asking of Nature, higher intellects and better instruments, than any that are at present in use, will have to be evolved; as doubtless they will be in the distant future. For these reasons the term "herd" is a very appropriate prefix to describe the attributes of human beings considered collectively, instead of individually, because it emphasizes the biological truth that there is little fundamental difference between a herd of deer, a herd of swine, and a herd of *Homo sapiens*.

Every district or environment supports a community of animal and plant life consisting of many species. The species in the same area are adapted to different parts, niches, or corners of it. These habitats overlap

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[1] Presidential Address to the Naval, Military and Royal Air Force Hygiene Group of the Society of Medical Officers of Health and reprinted by permission from *Public Health*, April, 1929.

and the species in them clash with each other to a greater or lesser extent, and in doing so interact on each other's life histories. The study of the mutual relationship between living organisms and their environment is known as ecology. Preventive medicine is mainly applied ecology; since it is based on the study of the mutual relationships between man, other living organisms and the environments they occupy, and the way these relationships affect human health. All the factors which form the human environment are continually changing. For example, consider the weather, the amount and type of movement in the human herd, and the ever-changing character of the bacterial herds whose environment is man himself. Therefore, it is obvious, no species can exist without some mechanism by which it can adjust itself to the alterations which continually take place in its surroundings. The power and rapidity of adaptation to different environments vary enormously in different species of animals. This quality whereby a species as a whole, or as an individual, can vary in response to different environmental stimuli may be called plasticity. Men and microbes are very plastic groups, and are thus able to adapt themselves to a wide range of physical and biological conditions. The ubiquity of bacteria has rendered it essential that, in order for man, or any other animal, to survive as a species, he should be able to respond as easily to changes in the bacterial flora of his environment as, say, to changes of temperature. It is important to distinguish the adaptive variations in animals, which are impressed on them by the environment during their life-time, from the hereditary specific characters, which may also be adapted to fit a particular environment, but which have been imprinted on the germ plasm during the passage of the species through geological time. In this respect plasticity, or the quality of producing adaptive changes when the need arises for them, is an hereditary specific character, but the resulting adjustments themselves are acquired non-inheritable characters. For example, the potentiality of producing diphtheria antitoxin in the blood is an inherent specific character of human germ plasm and as such is present in all individuals; but this potentiality only becomes apparent when the human animal finds itself in contact with the diphtheria plant. Other individuals of the species in whose environment there are no diphtheria bacilli, though possessing this power of forming antitoxin, never do so, because there is no need for it. The potentiality of forming antitoxin may vary in degree and such variations are true hereditary differences; but the actual presence of diphtheria antitoxin in the blood is an acquired character, and not inherited. The mechanism by which highly-specialized animals attained their hereditary adaptive specific characters is too controversial a subject to touch on here, but it seems that a species which in the course of evolution has become, probably through competition with other species, very closely adapted to a special environment sacrifices its plasticity in the process. The young of such a species may be likened to rigid metal castings, which will only fit the one special environmental mould wherein their ancestors were cast;

while the young of a plastic species are like lumps of soft wax which slowly take the impression of any surface they happen to lie on. A rigid species may have become so specialized to one form of existence, by the evolution of elaborate organs and apparatus, that it becomes unable to fit any other. Such a closeness of adaptation is a great advantage as long as the environment remains constant. But should the surroundings alter, the highly-specialized organism may find itself unable to fit the new conditions. In this way over-specialization may have accounted for the extinction of many of the species in the geological record. Over-specialization, however useful to the individual, is a grave danger to the species. It may be that this remark also applies to the medical herd! Man has fortunately remained a very primitive animal in general structure, and thus retained a large degree of plasticity. Perhaps a surgical analogy will make my meaning clearer. One can remove the top of a tonsil easier with a guillotine, which is closely adapted to this single environment, than with a scalpel; but if the environment changes from the tonsil to the leg, the guillotine becomes useless, while the scalpel can still do its job—it is the more plastic and less specialized instrument. Again, a man may not be able to exist on oats, or cross the prairie, as efficiently as the highly-specialized horse, but he can still climb a tree and live on nuts, while, as far as I know, the horse can do neither. The horse is a more specialized, but a less plastic and primitive animal than man. Man has also wonderful powers of adaptation to the various parasitic flora and fauna which inhabit his range of environments. Considering the extent of this range, and the rapidity and magnitude of the environmental changes man submits himself to, it can only be due to man's remarkable plasticity that there is relatively so little symptomatic parasitic infection in the world. When years ago I used to wander about Canton city, and travel up and down the Pearl River in one of His Majesty's gunboats, I marvelled, fresh from reading a textbook on hygiene, how the Cantonese managed to keep alive. There was no sanitation, no ventilation, and a density of population as great as that in any part of the world. The Pearl River itself is the main drain of a huge agricultural basin as well as the water supply of the thousand towns and villages on its banks. On the pea-soup waters of this river dwell myriads of families whose home is the junk or sampan they work on. Frequently the proprietor of one of these floating dwellings can be seen relieving nature over the bow, while his spouse collects the family drinking water over the stern. Although typhoid fever and intestinal diseases were common among sailors and other Europeans, yet as far as I could learn the Cantonese rarely suffered from clinical enteric fever. It might be argued that the escape was due to lack of contact with the parasitic causes of enteric fever, but Mendelson [1] gives some precise figures from Bankok, an environment not unsimilar to Canton. He states that among 35,000 Asiatics admitted to hospital he has not seen more than two or three patients with a clinical picture of typhoid fever, but that among 600 of the ordinary population, 98 (or 15·5 per cent) gave

positive Widal reactions, which means they must have been in contact even if not infected subclinically, with *B. typhosus*. I cannot see how we are to explain such observations as this, except on the theory of a special adjustment to the bacterial environment. The Asiatic baby is born with a passive immunity passed over to him from its mother by way of the placenta and milk. The mother's immunity has been acquired by continual doses of subinfections with the intestinal organisms which must contaminate almost everything she eats and drinks. In the native races of the East, it would almost seem as if there can only be two alternatives for the infant—death from infection, or adaptation to the local intestinal pathogenic flora by the acquisition of an active immunity before the congenital passive immunity has completely faded. Herein, perhaps, lies one of the causes of the very high infant mortalities of the Asiatic peoples. The absence of enteric fever is therefore not due to the absence of the specific organism, but to mutual adjustment between it and its human environment. I have only given this one series of observations to illustrate the importance of studying human infections as part of the general problem of adaptation to the environment, since I feel convinced that it is only by approaching human infection from the ecological point of view, and looking on epidemics as manifestations of a loss of balance between the mutual adjustment of host and parasite, that the natural laws controlling the periodicity, extent and malignancy of diseases of herd or individual will finally be defined.

Important as this subject is, to-day I wish to dwell chiefly on another biological quality which also is an adaptable character. Just as one species has to adjust itself to other species whose habitat coincides with, or overlaps, its own, so do the members of those species who live in herds or communities have to adjust their behaviour to each other in order to fit the special conditions of a gregarious life.

During the struggle between species to avoid elimination, certain members of the same species evolved the quality of acting together as units for their mutual benefit. The character of co-operative action was obviously an advantage, since it became preserved in many species, including man. With the social community or herd, a new quality or modification of the sex instinct had to be evolved in order that the individual would act for the herd as well as for himself. This quality is generally known as herd instinct. Herd instinct is such a powerful force in all human behaviour that it makes normal psychology a more important subject than most of those who are responsible for medical education seem prepared to admit. Anyhow, it seems to me that medical men who are responsible for the health of herds ought to give more attention to group psychology than they do. Generally speaking, it is the custom before anyone professes a trade to learn how to use the appropriate tools. For instance, no histologist would imagine he could do good work unless he knew something about the mechanism of the microscope, and above all, the definite limitations

of this instrument. It seems very strange, therefore, that the one tool which every human being has to use in order to exist, namely the brain, or engine of the mind, is the only one of the limitations of which it is thought worth while to warn the users. I propose to spend a little time in considering the frailties of this complicated machine which is liable to all sorts of errors and breakdowns. The brain as a machine is exceptionally dangerous because it seldom gives its owner any indication of when there is a screw loose in its gear-box. My apology for venturing to talk about herd psychology, of which I have little knowledge, is that even if I say things that are absolutely incorrect, in doing so I shall be furnishing a practical example of the importance of proper instruction in the subject, because it is self-evident that a naval officer, especially a medical one, should know something about group psychology, on which depends *morale, esprit de corps, élan,* and that subtle difference between happy and unhappy ships as the Navy terms them. All of which are of paramount importance to the fighting efficiency and the health of the Services. Perchance a little knowledge of psychology might also be of more use to the ordinary public health administrator ashore than even a sound knowledge of lavatory fittings, if it enabled him to coax his district council into putting up an abattoir, or rebuilding a slum in his district when the public health interests demanded it. I think that anyone who tries to get behind the fact, fiction, sound sense, and meaningless verbiage that has been written round the subject, since Freud enunciated the theory of unconscious mental conflict between antagonistic instincts and complexes, must realize that man is the unconscious plaything of his own emotions all the time he fondly imagines that he is a reasonable animal. That this is possible is largely due to that most important mental process called "rationalization," by which we unconsciously repress all the evidence against anything we wish to believe, and exaggerate everything in favour of our own desires. It is as well the human mind has this faculty; without it, life would be unbearable to the individual and co-operation impossible for the herd. If anyone has not sufficient power of introspection to see himself as an irrational being, he will anyhow be able to agree the proposition is true of his friends or his wife. If we can become aware of the fact that our motives are not always what we imagine them to be, the fact itself becomes less dangerous. Every honest research worker must have experienced the sort of feeling of temptation to ignore a piece of evidence, or belittle the result of some experiment which does not fit in with a favourite hypothesis. What, however, most workers do not realize is that such temptations may be succumbed to without the worker himself even becoming aware of the fact that his work has been vitiated by his own unconscious bias. This unconscious repression of significant facts probably accounts for much conflicting evidence in medical research, and makes it wise to keep an open mind with regard to all new scientific discoveries, until they have been confirmed—preferably by an enemy of the originator.

The above sources of error are caused by what may be termed endogenous suggestions, which arise out of the individual's own subconsciousness. Exogenous suggestion from a fellow-member of the herd may have an equally unrealized influence on the results of investigations or on the behaviour of herds and individuals. The following illustrations are from my own experience. At a time when I was examining the mechanical ventilation of one of H.M. cruisers, an officer complained that he was not getting a fair share of the air supply. I placed my hand over the air inlets in his cabin and mine, and agreed that there was less air coming into his cabin than into mine. But when an anemometer was substituted for the palm of the human hand, the instrument, being insusceptible to the power of suggestion, showed that air was entering the complainant's cabin at 22 miles an hour, which was at a rate three miles an hour more than in mine. Suggestion had made my hand an unreliable instrument for judging draughts. This illustrates why it is advisable to use instruments of precision in medical work, whenever possible, rather than trust to sense organs which are subject to all sorts of inhibitory and amplifying stimuli from the higher centres. Those honest but credulous individuals who are able by the aid of Abram's box to percuss out any area of dullness they subconsciously happen to think of, are another good example of the terrible limitations of sense organs when under the influence of suggestion. A more homely example of the power of exogenous suggestion has been seen by every naval officer who has had much experience of wine catering in the wardroom. If a self-opinionated but popular member of the mess declares "this wine is filth," three-quarters of the mess, being gregarious animals like sheep, will probably agree, and that wine is damned. The wise wine caterer says nothing. He merely removes the offending wine for a week or two and then replaces it without comment, with the almost invariable result that the reappearance passes unnoticed and the whole mess starts re-drinking "the filth" with gusto. This little anecdote introduces one of the greatest of the subconscious forces that sway us against our reason—the so-called herd instinct. I know that advanced Freudians say there is no such thing, and that what is called herd instinct is merely modified sex instinct, but for the non-elect herd instinct by another name would be just as real a force. Herd instinct is a biological necessity for gregarious animals such as man in order to get a group of individuals to act collectively. For example, imagine party government without it. If politicians, who I believe are as consciously honest as most herds, were really rational beings, how would it be possible for 600 members of Parliament to divide completely into the *same* two groups, each group completely convinced they were right on all sorts of subjects where, in most cases, the question to be answered is such that a definite "yes" or "no" is impossible. For example, take an issue like Free Trade. On such a subject the scientific attitude of a parliamentary candidate should be something like this: I regret that I have only studied the difficult

subject of political economy for twenty years, and I therefore do not feel fit to express an opinion that might, if acted on, ruin the country's trade. The factors which are involved in determining the success or failure of any tariff reform are so complicated, numerous, unknown, and uncontrollable, that the Government must organize some carefully controlled experiments under all kinds of commercial conditions before I dare express any opinion on the subject." One can scarcely imagine any parliamentary candidate getting elected after such a speech, yet to my irrational mind it is the only possible attitude on the majority of political questions, and on many medical ones. Perhaps herein is the reason why a scientifically critical mind makes a poor politician and often a poor medical practitioner. It is the horrid doom of the biological research worker who so often has to mistrust the apparent causes and effects of the events he sees happen in a test tube, to become more than sceptical of the loose explanations of the completely uncontrollable events which are recorded in the wide world outside his laboratory.

The world is subdivided into all sorts of herds—nations, races, social classes, professions, religions, and so on. Every individual is a member of many overlapping herds and sub-herds, each of which has its own prejudices, customs and taboos, and the urge not to offend against herd conventions is very great. Such traditions of the herd are scarcely founded on reason. At the time I was a medical student the controversy between certain London schools on the use of antiseptics in surgery was very keen. The contempt of St. Thomas's students, who were "aseptic," for King's men who were "antiseptic" was only equalled by the scorn of the King's students for the St. Thomas's technique. I do not suppose half-a-dozen of the hundreds of students expressing these opposite convictions ever bothered to find out that there was no statistical evidence in favour of either technique when practised by efficient surgeons. In this case, as usual, both sets of students blindly followed the leaders of their respective herds. Loyalty to tradition and the leaders of one's herd are worthy manifestations of herd instinct; without them the community life of a gregarious species would become unstable and chaotic, but at the same time they may become terrible barriers to scientific progress. If some great man, especially if he has a handle to his name as a mark of his herd's admiration, makes a statement on some subject he obviously knows nothing about, that is contrary to the pronouncements of some obscure investigator who has given his life to the study of the subject, nine out of ten people prefer to accept the great man's opinion rather than examine the carefully arranged evidence of the unadvertised scientific worker. And naturally so, since the great man knows he is right, while the obscure worker is full of reservations and doubts. As regards the rank and file, which most health administrators have to deal with, the ship's company, the industrial worker, and the regiment, the announcement that some famous film star or pugilist uses a quack medicine seems a far better advertisement than an endorsement by the whole College

of Physicians. No one seems to use their reason to consider the very fact of a person being an exceptionally beautiful woman, or a champion boxer, means they must be physically perfect animals who can really have no need for medicine. I am not sure that public health administrators should not make more use of this peculiar quality of herd instinct and subsidize some notorious criminal, or other herd hero, to broadcast genuine health propaganda.

Loyalty to the great intellects of the past is another form of hero-worship which often has a stultifying effect on scientific progress. The amazing sway Aristotle had over the opinion of the educated herd right through the middle ages is the best example of this phenomenon. There is a story illustrating Aristotle's influence which I have probably got wrong in detail, but which nevertheless illustrates the strength of authority over reason. Leonardo da Vinci showed one of his patrons a dissection of the aorta arising from the heart. At the conclusion of Leonardo's demonstration the patron congratulated him on his lucidity, and generously admitted he could have believed the aorta did arise in the heart if Aristotle had not said it came from the stomach. He preferred to believe Aristotle rather than the evidence of his own eyes. Even nowadays many educated men have their pet hero of the past, such as Moses, Darwin, or Hippocrates, of whom it is sacrilege to suggest that he may have been at fault in some detail on which the advance of knowledge has shed further light. There is something pathetic about this type of partisanship, since these great geniuses would have been the first to adapt their administration, methods, or hypotheses to fit fresh facts or environments, and would have rebuked their disciples for appealing to tradition and authority rather than to observation and experiment. An aspect of group psychology which affects the public health is the behaviour of the antagonistic individual who, owing to some psychic trauma or other cause, generally suffers from an inferiority complex. Such people are prone to band themselves into sub-herds, against the authority of the larger group which includes them. In the medical herd the anti-vivisectionist and the anti-vaccinationist are the most obvious examples of this type. The "anti-fanatics" form a very difficult administrative problem. They are consciously perfectly honest in their convictions, but their power of dissociation and rationalization is so great that they often seem to the saner members of the herd to be absolutely unscrupulous and dishonest, whereas really they are only completely inaccessible to logic. In a way it is lucky they are so, since they generally destroy their own cause by overstating it, and making the most absurd accusations against those who dare to differ from them. If you should be fortunate enough to meet one of these people who has successfully dissociated his pet aversion from contact with the rest of his reasoning powers which are otherwise good, you will see better than in any other way what I am driving at. A friend of mine, in general a commonsense fellow, a keen sportsman and rider to hounds, was, he said, a great lover of animals, but for some reason

or other could not bear the idea of vivisection, which he had probably got from posters of eviscerated dogs begging to brutal-looking pathologists waving large knives at them. He took me to book for my brutal habit of puncturing guinea-pigs, but I never could persuade him that hunting to death the animals he loved so much, or wounding them with shot guns, was just about as cruel as giving a guinea-pig a hypodermic injection. It was impossible to convince him that we were both cruel from motives which may or may not have justified the cruelty, according to our respective notions on the relative values of sport and research. The more I said, the more convinced he became that I was no sportsman and was probably satisfying some perverted sex instinct by torturing guinea-pigs. It is most important to realize that these "logic-tight compartments" exist to some extent in all our minds, though rarely developed to the extent one sees in the "anti-crank," and in more definite mental diseases. Occasionally, of course, someone in the minority to the general opinions of the medical herd hits on a great truth, as, for example, Lister, but such genius always gets recognition in the long run. Although educated authority should always be on guard against missing any real contribution to knowledge and critically examine all new work on its own merits, yet to-day, probably as the result of the lessons from history, the leaders of medical thought seem almost too tolerant. Every half-educated lunatic who gets smitten with the delusion that he has discovered a cure for cancer or something else seems able to collect a following. Orthodox medicine dare not be equally dogmatic in repudiating these "discoveries," and if it does suggest that such a man is an ignorant fool, the latter never hesitates to compare himself to Galileo, or some other scientific martyr, whom a corrupt and jealous medical profession refuses to recognize, in case they find themselves out of a job. I think psychologically it is better entirely to ignore these people; certainly it is waste of good men's time and money to undertake laborious researches to prove them wrong, because even if they are not completely inaccessible to logic with regard to their delusion, they are generally by the very nature of the mental process that must have led them to their so-called discoveries incapable of judging scientific evidence. It is wise, perhaps, just to state as simply as possible why they are wrong, for the sake of those among their followers who may be accessible to reason but not in possession of the relevant facts.

For the sake of argument, imagine all doctors to have no instincts and no other interests except the preservation of the health of their medical charges. The medical attendant of an individual will do what he thinks best for his patient even if others have to suffer in the process. In fact, this is often done when one member of a family contracts disease from nursing another by the doctor's orders. If we assume that the medical man considered his duty was to the whole family, as well as the individual patient, and that his patient would suffer if moved, the family practitioner would then have to weigh the probabilities as to whether the harm likely

to accrue to the family as a whole, by not moving his patient, was greater than the extra damage to the health of the sick man if moved, and act accordingly. When we pass from the family to the institution, ship, or barracks, it becomes more obvious that the primary duty of the herd doctor is to keep his herd in as high a degree of health as possible, even if individuals have to be sacrificed. For example, a sailor may have had tuberculosis and appear cured, but it would not be fair to the rest of the ship's company to let him return to the mess decks and risk his relapsing and infecting others; therefore his individual interests are sacrificed for the benefit of his herd.

Again, in the Royal Navy, there is no question but that vaccination against small-pox is a benefit to the whole herd, even if all its members have to suffer from a sore arm and a few days pyrexia. Because in such an environment as the mess decks of a ship a case or two of small-pox once introduced would cause an attack-rate of about 100 per cent among a ship's company who had had no previous experience of either small-pox or vaccinia virus. And, since the Navy gives leave all over the world, in many places where small-pox is endemic, such a disaster would soon occur if vaccination was not enforced. On the other hand, should it be possible, as some experts argue, to control severe small-pox by quarantine and limited vaccination after the introduction of infection, it would not be to the benefit of the English herd as a whole to produce, in all its 40 odd million members, a mild indisposition in order to save a few dozen from a severe illness, or even death. If the above argument were true, the policy of universal vaccination would then have to be critically examined by the health dictators, who should decide whether the expected number of cases of small-pox would cause more damage to the herd than the amount of disability produced by the vaccinia necessary to prevent them. I may add that my private opinion is that, under present social conditions, malignant small-pox could not be safely controlled in a completely unprotected community, since, if alastrim is small-pox, it is not controlled, even in a partially protected population.

The primary duty of an officer in charge of a sub-herd is the health of his own group only; he cannot be expected to consider the health of other sub-herds. Sometimes the health interests of two herds clash. In such cases the matter should be referred to a higher authority, who would be the health administrator of a group of sub-herds and would see that no individual group was allowed to benefit at the expense of the whole herd. He would weigh all evidence produced by the doctors of any sub-herds whose interests were antagonistic, and always give his verdict in favour of the health of the majority at the expense of the minority. Similarly, it is the primary duty of a herd specialist, who looks after only an individual organ of the body, to do his best for those parts he is responsible for—the rest of the body is someone else's business. As is well known, specializing on one organ of the body does tend to make a man lose sight of the other

parts. In a fleet on a foreign station an aural specialist pointed out that bathing was causing a lot of ear trouble. The prohibition of bathing was seriously discussed. As protector of the fleet's ears, the aural specialist's primary duty was to keep as many ears as possible continuously in working order; but the fleet medical officer, whose view was not restricted to the tympanum, considered the healthy habit of sea bathing did more good to the bodies of the herd as a whole, even should an extra individual ear or two suffer, and accordingly continued to encourage bathing.

Of course, in actual life, herds and health administrators have to compromise with each other when interests clash. But it is a salutary mental exercise to try and define what one's duty as a herd doctor would be apart from all other interests and influences, because other interests and forces, which may be as important as health and scientific progress, sometimes clash badly with preventive medicine. Nowhere can this be seen better than at a meeting of one of the societies for the prevention of venereal disease. It is seldom that half a dozen men can discuss this subject as dispassionately as they would, for instance, the prevention of measles. The subject invariably drifts from prevention to ethics, religion, and herd customs, or the prevention of fornication, which is not the same thing as the prevention of syphilis. In fact, the control of venereal disease is so mixed up with the two strongest forces in animal life, sex and herd instinct, that it is unreasonable to expect any half dozen men all to talk reasonably about the subject.

For the sake of argument, suppose we imagine an all-powerful health dictator of the world, who has no instincts, no sentiments, and no interest whatever but to produce the healthiest human stock. He would survey the population of the world as a farmer does his herds. All individuals below a certain physical and mental standard, who could not, or would not, do enough work to keep themselves, and were, therefore, an uneconomical proposition and parasites on the rest of the herd, would be exterminated. War, of course, would be forbidden; our passionless dictator could not tolerate the absurd idea of allowing 8,000,000 or more of his prime selected cattle to blow each other to bits merely to gratify their herd instincts, any more than he would allow them, for the same reason, the privilege of preserving about the same number of physically or mentally inefficient animals comfortably housed in palatial asylums, jails and institutions, while good young stock was deteriorating for lack of the shelter and the fodder which was used to keep useless animals alive. Further, this supreme health dictator, knowing a little general biology, would realize that the unchecked fertility and fecundity of *Homo sapiens* was sufficient to replace, in a generation or two, any losses due to the wholesale slaughter of the unfit. He would, therefore, probably combine carefully selected breeding from what he considered the best human stock, with ruthless slaughter of those races with less physical and mental ability. He would in time be able to breed out such irritating characters of the herd as patriotism,

sentiment, and romance, and in fact eliminate everything which we poor irrational beings, on a lower plane of evolution, imagine make existence worth while. However, mercifully, all of us will have been dead for some eons before such a millennium of perfect health administration becomes possible. But I do think a nightmare of this sort makes us wonder whether more of the medical and social services might not be better employed in looking after the fit, and those who can be made fit, rather than in spending so much time on the care of cripples, cretins, and criminals. Truly, medical men are far too sentimental to do their job scientifically. I can offend none if I give myself as the horrid example of this statement. For about nine years I had been studying in a school environment between *Homo sapiens* and *Bacillus diphtheriæ*, and was under the delusion (a delusion is a fact to its possessor) that I was about to make a useful addition to medical knowledge, provided that I could only get in another two or three years of observation. The school medical officer who, correctly, only considered his own medical charge, and did not care a button for posterity, asked me to immunize the school. Owing to a special set of circumstances, the decision to do so practically rested with me. After an exhausting mental conflict between my herd instinct and scientific duty, I yielded to the school doctor's importunity and the herd was immunized. The anticipated calamity followed. The diphtheria bacillus found the sudden alteration in its environment too great for its power of adaptation, and so diphtheria faded away, and with it the opportunity of this epoch-making discovery. Although a crime of the first magnitude had been committed against science—for what does a few children getting or dying of diphtheria matter, compared with the march of medical knowledge and the ultimate benefit of the many at the expense of the few—yet my reason is so warped by herd instinct that I actually count this crime a virtue. The above paragraph is, anyhow, a good instance of the limitations of one brain. On re-reading it, I find my introspective powers are not good enough to decide how much of it I mean literally or satirically: therefore the audience can take it either way their instincts urge them.

A critic may justly remark that all that has been said is instinctively known by the tactful and tolerant man, who realizes that neither himself nor others always behave rationally. But all are not born tactful and tolerant and, in my opinion, a little psychological reading is most helpful in getting public health measures carried out by those in authority and coaxing the herd we are in medical charge of—the sailor, the soldier, and the man in the street—into a healthier way of living.

Diseases of the herd are known as epidemics or endemics. There is no hard and fast line between epidemic and endemic disease, just as there is no sharp division between the acute and the chronic infections of individuals. Fatality, which is the ratio of the number who die of a disease to the total number who show its symptoms, is one index of the malignancy of the infection as it affects the individual; whereas mortality or the ratio of

those who die to the whole population at risk, can be used as an index of the malignancy of the infection as it affects the whole herd in contrast to the individual. The fatality is the probability of the average individual once infected with symptoms dying. The mortality is the probability of the average member of the herd, whether infected or not, dying. To the general practitioner, fatality is the more important ratio on which, in combination with clinical observations peculiar to each patient, he bases his prognosis. To the public health administrator, mortality and morbidity, which indicate the malignancy and extent of the disease as it affects the community as a whole, are the more practical figures. A comparison of these ratios for two diseases as they affected the same herd, while living under the same environmental conditions, will illustrate the relative importance of these common ratios to the individual and the herd. Among the 90,000 men who manned the Grand Fleet in 1918, the morbidity for meningitis was less than 2 per 10,000 per annum. The fatality was about fifty per cent of cases. The mortality was, therefore, less than 1 per 10,000 men. The corresponding figures for influenza were: morbidity 2,000 per 10,000; fatality 1 per cent, and mortality 18 per 10,000 men. The individual once infected with meningitis had to face a chance of dying which was fifty times as great as in influenza, but the probability of any member of the herd dying of influenza was eighteen times as great as his dying of meningitis, and the risk of getting influenza was at least a thousand-fold greater than of catching meningitis. The preservers of the Navy's health never had the slightest fear that meningitis would seriously interfere with the efficiency of the fleet, whereas at one time man-power was so crippled by influenza that it was doubtful if some ships could have left harbour. Therefore, the herd doctor need not waste much time over meningitis but, owing to its severity, meningitis is of grave import to the medical attendant of an individual. The position is reversed in the case of influenza, which is always a cause of the gravest anxiety to the health administrator, but to the infected individual a one per cent risk of death is almost negligible. These figures introduce one of the chief uses of simple statistics in practical medicine, which is to substitute a precise quantitative measure for that vague sense of proportion and relative values which everyone acquires, to a greater or less extent, by observation and experience. A man with no sense of proportion is nearly as irritating as a man with no sense of humour; in fact, humour depends on a feeling for relative values. In the example just given, the importance of meningitis and influenza to the naval herd is quantitatively measured, and I think the statistics show the relative importance of influenza to be much greater than many would have believed, because owing to the striking character of the meningitis cases, our intuitive sense of proportion might have led us astray. Moreover, sense of relative values, uncorrected by statistics, is often completely smothered by herd prejudices or sex instinct. The most blatant example of this is the disappointed lover who, having

been let down by one woman, declares the whole sex is false. Less forgivable is the man who condemns some method, or forms a general opinion, from one event. In the days when the Wassermann reaction was under trial, I more than once heard the remark made that the test was useless, because a case, which the speaker had decided was syphilitic, had given a negative reaction. In the first example I have not collected sufficient data to tell you what percentage of women are false, but as regards my own experience of some 50,000 Wassermann tests the results are false in not more than 5 per cent of clinically diagnosable syphilitics. This is as close an agreement as one can hope for between a complicated immunological reaction and clinical diagnosis. Statistical methods are really fundamental and are used unconsciously by all of us every day. For instance, when we stand at the hall door and debate with ourselves whether or not to take an umbrella, we are estimating the probability of its raining from our past experience of the frequency with which rain has fallen on similar looking days. The whole principle of the medical diagnosis of individual patients is based on statistics, which show the frequency with which certain signs and symptoms are associated in a series of cases. In the better textbooks an actual statistic is generally given, as, for instance, when Osler states that out of eighty-eight cases of pleurisy at the Johns Hopkins Hospital thirty subsequently were found to be tuberculosis. If this sample was a representative one, it becomes known that the probability of a case of pleurisy being tuberculosis is about one in three. In the study of disease collectively the statistical method has chiefly to be employed because, although the easier experimental method will generally produce quicker and more trustworthy results, there seems to be a very strong herd taboo against experimenting on human animals. All the same one sighs to think of all the good material, going to waste in jails and mental asylums, that should be available for this purpose, more especially as so few of us have either the ability or time to acquire a deep knowledge of statistical theory and technique. Nevertheless, if anyone really understands "the rule of three," and takes the trouble to acquaint himself with the common pitfalls in handling medical statistics, quite useful work may be done, especially in collecting data which can be used by the mathematical statistician. Undoubtedly the most difficult part of the statistician's manipulations is in attempting to correct his mathematical results for the way in which the data were collected. Many people distrust statistics because they are consciously or subconsciously frightened of them, and excuse themselves for lack of interest by some such fatuous platitude as, "that statistics are useless since they can be made to prove anything." Now, when a class of school boys are set a sum in arithmetic, between them they may produce a dozen solutions, but only one answer is correct and has proved anything. When, in addition to crass ignorance of arithmetic, a person commits all kinds of blunders in collecting his data, I suppose a set of figures can be maltreated to such an extent as to produce any sort of false result, but this

has not proved anything except the inefficiency of the would-be statistician. Probably in many cases the dislike of statistics is really instinctive, because when anyone is trying hard to rationalize evidence to suit his own case, he is prone to use indefinite expressions such as few, many, a negligible number, or a considerable percentage, instead of an exact figure. Any of these vague expressions of quantity could, according to circumstances and the individual using them, stand for five per cent. Therefore, as far as possible, all such terms should be avoided in a scientific paper. Even if the exact number is not known, often an approximation such as more than half, or less than ten per cent can be substituted for many or few. Sometimes an author will, without thinking, substitute a vague expression for a known number because he is unconsciously trying to sway his reader to his point of view. The reader should at least be given the opportunity of judging for himself what the writer considers a fair percentage or a negligible number. In searching epidemiological literature I have often come across most interesting papers, which have been made most tantalizing, and useless for my purpose of comparing the behaviour of disease under different conditions, because the author would not report his figures, which it was obvious he must have known.

After excluding subconscious bias, I think by far the greatest difficulty in collecting material for medical statistics is the question of diagnosis. Accurate diagnosis is essential in order to recognize, with some degree of certainty, the thing that is being collected as coming within the definition of its class. Owing to obvious pyschological causes, most people must tend to under rather than over-estimate the number of diagnostic mistakes which they make. All honest clinicians are fully conscious of cases they have had to put a name to where the probability that the name was wrong was not small; but the difficulty of obtaining any precise index of the magnitude of the average number of diagnostic errors seems almost insuperable. Those who, like myself, have performed post-mortems on their own patients who have succumbed in spite of, or because of, their treatment in the wards will realize how it is sometimes very difficult to rationalize what the patient was alleged to be suffering from before death with what is exposed at the autopsy. Cabot [2] compared the clinical and post-mortem diagnosis of 3,000 patients. He listed twenty-eight diseases, and the agreement between the pre- and post-mortem diagnosis declined from ninety-five per cent in diabetes to sixteen per cent in acute nephritis. Active phthisis was only discovered before death in fifty-nine per cent of the cases who presumably died of it. These startling figures were from an up-to-date hospital with all its advantages for accurate diagnosis. Therefore, if they are from representative samples they should be the measure of a better standard of diagnosis than what prevails under ordinary conditions of practice. Cabot says, "That a study of the details of the cases before and after death convinces me . . . that few of the mistakes tabulated could have been avoided." The value of this striking article is, however, greatly

diminished, since it is not clearly indicated how these 3,000 autopsies were selected. If they were a pure random selection, that is, if the series refers to consecutive deaths in hospital from the diseases mentioned, the results are a great eye-opener. But, on the other hand, suppose that these cases were examined post mortem only, because the clinical diagnosis had been in doubt, the figures would then have little significance. Again, to my mind, an unpardonable statistical sin is giving such percentages without mentioning the size of the samples they refer to. For example, if forty-one per cent of those who died of phthisis were not recognized in life, it gives one "furiously to think," provided the percentage was obtained from over 100 random autopsies. But if there were only ten cases of phthisis in this series, then the four missed cases which forty-one per cent would represent might have easily been an exceptional group, and the statistic would have little significance. However, this paper strongly suggests that between a quarter and half of the clinical diagnoses of cause of death at an up-to-date hospital were wrong. In my opinion, it is merely avoiding unpleasant facts to rationalize them away by comfortably assuming that the medical staff of this hospital were more ignorant than the average. Looked at dispassionately, the very fact that such figures found their way into print is a testimonial to the ability and conscientiousness of the clinicians concerned. A negligent or ignorant hospital staff would not have tolerated their publication. As regards medical diagnosis, the old aphorism that "a man who never made a mistake never made anything" contains a very great truth, so long as it is not used as cover by the man who never makes anything else. If Cabot's paper represents anything near the truth, it becomes possible to realize the difficulties of the medical statistician, who, if he is investigating the causes of death in a community, would have to allow for errors in diagnosis, which vary from five to eighty-four per cent according to the nature of the fatal disease. If these figures are a reflection of real facts they also demonstrate how precise figures correct our instinctive sense of relative values. I do not believe my clinical acumen to be worse than the average, or that I make over thirty per cent of false diagnoses, but, from the little I know of psychology, there are so many subconscious reasons why I should be loth to admit such a huge error in diagnosis, that I would not really be surprised if a statistician was able to prove, that on average, I did make a mistaken diagnosis once out of every three attempts. Recently, Raymond Pearl [3] has emphasized the fundamental importance of statistics in the study of "the biology of groups," of which subject preventive medicine is, of course, a part. He says: "If the group of living things be considered as group or 'whole,' it plainly has attributes 'which are peculiar to itself.' These attributes demand description and measurement, just as much as do corresponding attributes of the individual. Upon them will rest the foundations of any science of group biology. . . . Statistical technique furnishes the only means available for accurately and adequately describing and measuring the attributes of groups. . . .

Ordinary methods of description fail because they are fundamentally incapable of giving a description of the group (whatever its magnitude) in terms of anything but the individuals which compose it." Of later years, thanks largely to the inspiration of Major Greenwood, many workers in preventive medicine realize that this is true. But most of us are too dull, too tired, or too busy to acquire the difficult mathematical technique. The proper place for instruction in mathematics is at school or university. The subject "applied mathematics" bulks largely in many educational syllabuses, but the mathematics do not seem to be "applied" to the study of the attributes of the human herd. One might think the subject could be modified to do so with advantage to the young of a gregarious species, whatever their future careers. The elements of bio-statistics should form part of the herd's general education, instead of being considered a special subject only of interest to a few peculiar individuals.

I have kept you an hour discussing three fundamental subjects, to wit, evolutionary biology, normal psychology and statistical theory. As yet, these sciences, or at least the two first, do not bulk largely in the medical curriculum. Medical students, and I include all qualified men in this herd, have little enough time to digest the mental pabulum they already receive; but the little I have been able to glean for myself about these sciences has been such a help in connecting up in a rational manner so many incongruent and otherwise irrelevant facts and hypotheses, that I believe the time spent on these subjects is regained in the way they have made technical and practical medicine easier to memorize and understand. Therefore, at the risk of exposing my own ignorance, I have tried to prove that the prevention of disease in herds and individuals necessitates a proper understanding of their evolutionary biology and psychology.

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[2] Cabot, R. C. *Journ. Amer. Med. Assoc.*, 1912, lv, 2295.
[3] Pearl, R. "The Rate of Living," London, 1928.

PART I AND PART II OF EXAMINATION OF MAJORS, R.A.M.C., FOR PROMOTION TO THE RANK OF LIEUTENANT-COLONEL.

By Major A. C. ELLIOTT.

Royal Army Medical Corps.

(*Continued from p.* 435, *Vol. LII.*)

Instructions were issued to candidates that they should report at the office of A.D.M.S. Poona district at 17.00 hours on October 20, 1925; on arrival there each of them was given the following task, with orders that its solution was to be handed to the president of the examining board of officers at 07.00 hours on Wednesday, October 21, at A.D.M.S.'s office, on which date the practical part of the examination in the field was due to commence.

Task 1 (*A*).

Draft Medical Orders for Inclusion in 3rd Corps Standing Orders.

It was fortunate for candidates that they had plenty of time (overnight) to prepare these orders, which constituted the beginning of the practical test and formed part of Exercise 2 of this test.

"Abbreviations" state that the object of standing orders is:—

(i) To adapt existing regulations to local conditions.

(ii) To save frequent repetition in routine and operation orders.

It is also stated that standing orders must be confined to essentials and that the repetition of existing regulations is to be avoided.

In the framing of medical orders for insertion in the standing orders of a formation, it will be found difficult to avoid repeating existing regulations; a glance at any standing orders of this nature will probably prove the truth of this assertion, and in point of fact it is sometimes advisable to quote existing regulations (especially as regards sanitation) to help to drive home their importance.

The following is a suggested solution of Task 1 (A).

Medical Orders for inclusion in 3rd Corps Standing Orders.

Copy No. 1.
Date: October 20, 1925.
Place: Poona.

(1) Men falling out sick on the line of march will be seen by unit M.O. If he considers that they will be fit to carry on, but merely require a "lift" to help them along, he will give them a written statement recommending said "lift" for the men and their equipment on any transport available. If no transport is available they should be left in shelter on the roadside to be picked up by the field ambulance. If he thinks that they require admission

to a field ambulance he should attach a field medical card showing their disability.[1]

(2) Sick will be seen under unit arrangements, and units or details having no M.O. will send their sick to the nearest unit possessing one. All sick for evacuation from unit aid posts will be ready for collection at 08.00 hours daily.[2]

(3) All troops will be medically inspected thoroughly at least once a week; clothing also to be inspected and special attention directed towards detection of vermin and skin disease. Troops to be instructed under unit orders to report sick at once if they find vermin on their bodies or clothing.

New arrivals in units or camps to be medically inspected at once; departures to be similarly inspected.

(4) First field dressings to be frequently inspected and M.O.'s to ensure that all ranks in their charge are thoroughly familiar with the use and the method of application of this dressing (*vide* "F.S.R.," Vol. I, Section 186).

(5) All units to be inoculated (T.A.B.) and vaccinated to 100 per cent.

(6) Troops not to partake of food or drink in any shape of form except from anthorized sources of supply.

(7) Hawkers not to be allowed access to troops on any account.

(8) All bivouacs, camps, billets, rest camps, &c., to be kept scrupulously clean and to be left in a similar condition by units on their departure (*vide* "F.S.R.," Vol. I, Sections 177 and 178).

(9) Food-stuffs must be protected from contamination by flies by improvised safes of sacking, muslin, &c., and the various methods of destroying flies and preventing their breeding detailed in Chapter VI of "Army Manual of Sanitation" should be applied where possible. Fly-killing solutions are available at "Supplies."

(10) All tanks containing water for drinking must be clearly labelled "Drinking-water."

(11) The measures detailed in "F.S.R.," Vol. II, Sections 183 and 188 regarding conservancy on the line of march, in bivouacs, camps, standing camps, rest camps, and billets, will be strictly observed. They are in brief as follows:—

Line of March.

(*a*) Short halts—men easing themselves to be directed to cover excreta and urine well with earth.

(*b*) Long halts—(e.g., half hour to two hours)—shallow trench latrines and urine pits to be provided; ground so used to be marked "FOUL" by units before quitting.

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[1]*Vide* "R.A.M.C. Training," para. 209 and "F.S.R.," Vol. II., Section 159, para. 5, as amended by A.O.'s of January, 1926, which states that "No man will be allowed to ride in transport vehicles or to place his equipment and arms on them without the written permission of an officer."

[2]*Vide* "R.A.M.C. Training," paras. 206, 207, 221 and 222.

Bivouacs.

• Improvised pails (biscuit tins, etc.), and incineration, but if this is not practicable the procedure in (*b*) above to be adopted. The most scrupulous sanitary precautions to be observed in bivouacs as the bivouacs of to-day may be the lines of communication to-morrow.

Camps *Standing camps* *Rest camps* *Billets*	Pail removal system plus incineration where possible—otherwise deep trench systems. Large urine pits to be used.

(12) Refuse to be disposed of by incineration.

(13) Waste water from ablution places, kitchens, etc., to be led *via* grease-traps into soakage pits or suitable drains.

(14) Manure to be burnt or "tight-packed."

(15) Slaughtering places to be at a distance from camps, bivouacs, etc., and, where possible, an impermeable surface with a gutter to be provided on which animals will be slaughtered. Offal to be disposed of by incinerator.

(16) Carcases of animals dying in or near camps, etc., to be disposed of by burning or partial burning and burying.

(17) Antimalarial measures require careful selection of bivouacs and camp sites where possible (*vide* "F.S.R.", Vol. II, Section 180 (2)). Unit measures involve the establishment of good surface drainage, prevention of collections of stagnant water and clearance of undergrowth. Mosquito nets to be used; anti-mosquito oils, pomades, etc. (available from "Supplies") to be used by men on night duty. Knee flaps of shorts to be worn down between sunset and sunrise.

(18) Troops not to be allowed to be in possession of dogs, or such pets, owing to the danger of rabies. All stray dogs showing any indication of rabies to be shot at once.

(19) E.T. outfits and E.T. rooms to be available in units, camps, etc.

(20) Special precautions to be taken to ensure that all followers, many of whom are undisciplined, observe all orders *re* sanitation (*vide* "F.S.R.," Vol. II, Section 144(5)).

F. ....S......R.
Major, R.A.M.C.,
D.D.M.S. 3rd Corps.

Copy No. 1 to "A" 3rd Corps.
2 to File.
3 to War Diary.

On the morning of October 21, 1925, the candidates for the examination reported at 07.00 hours at office of A.D.M.S., Poona, where they met the examining board of officers, who criticized the appreciations sent in by each candidate. The board also criticized the solution of Task 1A.
The board's own solutions of the task were also given in accordance with

King's Regulations, Appendix X, which directs that, for instructional purposes, it shall give its solutions to each problem with reasons. After these criticisms the actual practical work in the field was commenced with the issue of the following narrative, associated with Task 2, to each candidate.

NARRATIVE NO. 1.

(*For issue on the morning of October* 21, 1925.)

On 19 October, 1925, Yellow made an attack with two divisions on the Brown position at Khandala and, after heavy fighting, succeeded in dislodging 8th Division from its position and forced it to retire as far as Talegaon-Dabhade. Casualties amounting to about 2,000 were evacuated to to the C.C.S. at Talegaon and by hospital train and M.A.C., thence to Poona and onwards by rail to hospitals at Ahmednagar, Sholapur and Belgaum.

Subsequently the C.C.S. was closed and reopened at (place to be selected by the candidates).

9th Division from reserve in Ahmednagar, having detrained at Poona on the morning of October 21, will be ready to march by noon that day.

On the evening of October 20, 8th Division occupied a position astride the Bombay Road from Kinhai (Y. 4520) to Raoat (E. 4786).

The following operation order was issued.

SECRET.

8 DIV. OPERATION ORDER NO. 100.

Copy No. 10.
Date : 20 Oct., 25.

Reference Map, Poona District, Sheet 47/F *and* F/14, *one inch to one mile.*

Information.

(1) Regarding the enemy.—The enemy, estimated at two divisions, has succeeded in forcing 8 Div. to withdraw from its position at Khandala in an easterly direction.

(2) Regarding our own forces.—8 Div. is now retiring eastwards along main road, Poona-Bombay; 9 Div. will be arriving by train at Poona on morning of 21 Oct., and will be ready to march by noon same day.

Intention.

(3) 8 Div. will take up a position running north and south between Kinhai (Y. 4520) and Raoat (E. 4786) covering the railway Poona-Bombay and the roads to the south of Indrayani river. It will stop the enemy on this line.

Method.

(4) The position will be occupied by 23 Inf. Bde. on the right, and 25 Inf. Bde. on the left, and inter-Brigade boundary will be incl. road Poona-Bombay to right sector throughout.

(*a*) The position will be occupied in depth on the line Kinhai (Y. 4520)—Chincholi (Y. 5113)—14½ milestone road Poona-

Bombay—B.M. 1976 (Y. 4603)—13 milestone old road Bombay-Poona to Pauna River west of Raoat Village (E. 4487).

(*b*) The line of forward defended localities will be nullah running north and south 400x west of Kinhai—B.M. 1995 (Y. 4108)—14 milestone old road Bombay-Poona, bend of Pauna River (E. 4487).

(5) 24 Inf. Bde. will be in divisional reserve in vicinity of 13 milestone road Poona-Bombay, and will occupy a position covering that road, and the road to the north on the general line Point 1969 (E. 4789)—Point 1944 (F. 0375)—Wireless Station.

(*a*) 24 Inf. Bde. will carry out a reconnaissance of the country south-west of 13 milestone road Poona-Bombay, with view to a counter-attack.

(6) Arty. Right sector will be covered by 20 Fd. Bde. and left sector by 21 Fd. Bde.

(*a*) C.R.A. will arrange antitank defence over the divisional front in consultation with O.'s C. Infantry Brigades and C.R.E.

(7) R.E. The following tracks will be made fit for light motor traffic:—

(*a*) Point 1969 (E.8789), Chinchivad Ry. Sta.

(*b*) Chinchivad, Point 1902 (E.6069).

(8) R.A.F., etc., etc.

Administrative Arrangements.

(9) Supplies, S.R.P. at Kirkee Ry. Sta.

(10) Ammunition, etc., etc.

(11) Medical (to be issued by A.D.M.S.).

(12) Transport, etc., etc.

Inter-Communication.

(13) 8 Div. H.Q. will close at Shelarwadi Rly. Sta. (Y. 4108) at 15.00 hrs. October 20, and open at 11 milestone road, Poona-Bombay, at same time.

(*a*) 8 Div. Advanced H.Q. will open at road junction Y. 5904 at 15.00 hrs. on October 20.

(14) (*a*) 23 Inf. Bde. H.Q. at Point 1969 (Y. 6321).

(*b*) 25 Inf. Bde. H.Q. at Temple (E. 5897).

(*c*) 24 Inf. Bde. at 13 milestone main road, Poona-Bombay.

Acknowledge.

S......A.

Colonel, G. S.,

8th Division.

Issued to Sigs., 8 Div., at 14·00 hrs.

Distribution as per list X.[1]

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[1] For indicating the units to which operation orders are directed, the General Staff sometimes adopt the words, "Distribution as per list X, Y, or Z, etc."; in this way a certain amount of secrecy is maintained in the event of an order falling into the hands of the enemy. At the examination under discussion, candidates should always indicate at the end of their orders, reports, etc., the recipients individually, as this sometimes constitutes a point on which the examiners desire to test the candidates' knowledge.

Task 2.

As A.D.M.S., 8th Division.

(1) Make a reconnaissance of the area Poona to front, to ascertain the facilities for entraining and detraining casualties, and locations suitable for C.C.S. advanced depots of medical stores and field ambulances.

(2) Draft administrative arrangements medical for 8th Division Operation Order No. 100.

(3) Write R.A.M.C. Operation Orders pursuant to 8th Division Operation Order No. 100.

It will readily be understood that para. 1 of above task comes under Exercise 3 of the examination, while paras. 2 and 3 come under Exercise 2.

Before proceeding to a suggested solution of Task 2, it may not be out of place to direct candidates' attention to the following points regarding operation orders as given in "Abbreviations."

(*a*) An operation order must contain just what the recipient wants to know, and nothing more.

(*b*) Operation orders will usually be merged under the six subject headings indicated in 8th Division Operation Order No. 100 above. The paragraphs will be numbered consecutively throughout the order, and sub-paragraphs lettered in such a way as to admit of easy reference. Sub-paragraphs, however, will not be subdivided by further lettering or numbering.

(*c*) No abbreviations other than those authorized are to be used, and the writer of an order, report, etc., must exercise judgment in the employment of abbreviations, and must not use those with which the addressee is likely to be unfamiliar.

Note.—Abbreviations should be given correctly and used consistently; e.g., write Fd. Amb. (correct abbreviation), but subsequently do not write Field Amb. or Fd. Ambulance.

Suggested Solution of Task 2.

Suitable sites for C.C.S.'s in Poona are:—

(i) Council Hall.

(ii) Gymkhana Club and grounds.

The above sites are considered good for the following reasons:—

(*a*) Good approach, giving entrance and exit facilities for wheeled traffic.

(*b*) Good buildings and outhouses.

(*c*) Plenty of surrounding space for pitching tents.

(*d*) Good piped water supply.

(*e*) Electric light and fans.

(*f*) Convenient to railway station.

(*g*) In main building good accommodation for wards and reception room with the latter's adjuncts, namely, resuscitation ward, pre-operative ward, operating theatre, etc.

(*h*) Accommodation available for administrative branch, stores, etc.

(*i*) Sanitary arrangements, these are insufficient but can be enlarged by improvisation.

Site suitable for advanced depot of medical stores is a building opposite and west of the Council Hall. This site has a good roomy yard, good main building and outhouses, all of which are secure.

Facilities at Poona railway station for entraining and detraining sick and wounded are not good for the following reasons :—

(*a*) There is no platform on broad gauge available for such work except the long main platform.

(*b*) There is no platform for metre gauge system.

(*c*) The direct transit of cases from one gauge system to the other would involve their passing across railway lines which would be dangerous.

(*d*) Ambulances cannot get near the metre gauge system.

Note.—Reasons should always be given in support of solutions. (*Vide* K. R., Appendix X.)

The candidates made a reconnaissance of the right and left sectors of the defensive position, and selected sites for their medical units. Having selected these sites they were then in a position to write as A.D.M.S. of the division, their administrative arrangements and R.A.M.C. Operation Orders in something after the following manner.

SECRET.

ADMINISTRATIVE ARRANGEMENTS MEDICAL FOR 8 DIV. OPERATION ORDER NO. 100.

Copy No. 1.
Date : 20 Oct., 25.

(1) A.D.S. for right sector will be at Chincholi at junction of track with main road Poona-Bombay (Y. 5804).

(2) A.D.S. for left sector will be at junction of track and main railway Poona-Bombay at E. 5809.

(3) W.W.C.P. will be at Nigadia (E. 6695).

(4) M.D.S. will be at Chinchivad.

(5) Above medical units will be in position at 05.00 hrs. on 21 Oct.

F......D......S.
Major, R.A.M.C.,
A.D.M.S., 8 Div.

Copy No. 1 to " G."
2 to File.
3 to File.
4 to War Diary.

Unless one is *au fait* with " Abbreviations," the task of being called upon to write " Administrative Arrangements Medical for insertion in an operation order " may appear somewhat staggering. The task

becomes easy, however, when it is realized that "Abbreviations" state that under the heading of "Administrative Arrangements" in an operation order come paragraphs giving general instructions as regards arrangements for supply, transport, ammunition, medical services, etc. These paragraphs, which are framed in consultation with the branches of the service concerned, will be limited to what it is necessary for all recipients of the order to know. Applied to the medical services the foregoing amounts to this, namely, that a divisional commander issues his order for battle, and all that recipients of that order want to know, with regard to the medical service, is where medical aid can be received; this information is conveyed to them in the medical para. of "Administrative Arrangements."

"Administrative Arrangements" are not to be confounded with "Administrative Instructions"; the latter are drawn up by A.G.'s and Q.M.G.'s branches of the Staff and are corollaries to operation orders; they are separate *instructions* issued in conjunction with an operation under or as a preliminary to such an order, particularly when major operations are contemplated.

SECRET.

8 DIV. R.A.M.C. OPERATION ORDER NO. 82.

Copy No. 1.
Date: 20 Oct., 25.

Reference Map, Poona District, Sheets 47F/10 *and* F/14, *one inch to one mile.*

Information.

(1) Regarding the enemy. The enemy, estimated at two divisions, has driven 8 Div. from its position at Khandala in an easterly direction.

(2) Regarding our own forces. 8 Div. is retiring eastwards along main road Poona-Bombay, and with view to stopping the enemy, it is taking up a position on line running north and south between Kinhai (Y. 4520) and Raoat (E. 4786) covering the railway Poona-Bombay and the roads to the south of the River Indrayani.

(*a*) The position is being occupied in depth by 23 Inf. Bde. on the right, and 25 Inf. Bde. on the left; inter-Brigade boundary will be inclusive road Poona-Bombay to right sector.

(*b*) The line of forward defended localities is nullah running north and south 400 yards west of Kinhai—B.M. 1993 (Y. 4108—14 milestone old road Bombay-Poona, bend of River Pauna (E. 4487).

(*c*) 24 Inf. Bde. is to be in divisional reserve in vicinity of 13 milestone road Poona-Bombay.

Intention.

(3) The evacuation of casualties will be carried out by the formation of:—

(*a*) A.D.S. for right sector.
(*b*) A.D.S. for left sector.
(*c*) W.W.C.P.
(*d*) M.D.S.

(4) Motor ambulances will be pooled.

Method.

(5) 23 Fd. Amb. will clear right sector.

(*a*) Two sections will form A.D.S. near Chincholi at Y. 5013.

(*b*) One section will form W.W.C.P. at Nigadia (E. 6695).

(*c*) H.Q. and two sections will be at junction of Chincholi track with road Poona-Bombay and assist in transferring cases from bullock tongas to motor ambulances.

(6) 25 Fd. Amb. will clear left sector.

(*a*) One section will form A.D.S. at junction of track with railway Poona-Bombay at E. 5890.

(*b*) H.Q. and three sections will form M.D.S. at Chinchivad.

(7) All above units will be in position at 05.00 hrs. on 21 Oct.

(8) 24 Fd. Amb. will be in reserve with the 24 Inf. Bde. near point 2062.

(9) Men of Bearer Unit will report at 05.00 hrs. on 21 Oct., for duty as follows :—

(*a*) 60 men to A.D.S. for right sector.

(*b*) 100 men to A.D.S. for left sector.

(*c*) 40 men to 24 Fd. Amb. in reserve.

(10) 24 Fd. Amb. will detail an officer to take over command of pooled motor ambulances; it will also detail one N.C.O. and two men to assist him.

(*a*) Fd. Ambs. will despatch their motor ambulances to report to above officer at 12 milestone road Poona-Bombay by 06.00 hrs. on 21 Oct.

(11) Car posts will be established as follows :—

(*a*) Two cars at junction Chincholi track with road Poona-Bombay.

(*b*) Two cars at 14 milestone road Poona-Bombay.

(*c*) H.Q. and five cars at 12 milestone road Poona-Bombay.

(*d*) One car at W.W.C.P.

(*e*) O.C. pooled cars will reconnoitre track Nigadia—Railway Poona-Bombay for suitable car post for two cars.

Administrative Arrangements.

(12) Supplies for consumption on 21 Oct. will be at Chinchivad Ry. Sta. at 20.00 hrs. on 20 Oct.

(13) A dump of 400 stretchers and 800 blankets will be available at Chinchivad Ry. Sta. by 04.00 hrs. on 21 Oct.

Inter-Communication.

(14) Office of A.D.M.S. will close at Shelarwadi Ry. Sta. (Y. 4108) at 15.00 hrs. on 20 Oct. and open at 11 milestone road Poona-Bombay at same time.

(*a*) Reports will be sent to A.D.M.S. at advanced D.H.Q. at road junction at Y. 5904 from 17.00 hrs. 20 Oct. onwards.

(*b*) 23 Inf. Bde. H.Q. at Point 1969 (Y. 6312).
25 „ „ „ at Temple (E. 5897).
24 „ „ „ at 13 milestone road Poona-Bombay.

Acknowledge.

F......D......S.
Colonel, A.D.M.S.
8 Div.

Issued by S.D.R. at 14.45 hrs.
Distribution :—

Copy No. 1. to "G."
2. „ "A."
3. „ 23 Fd. Amb.
4. „ 24 „ „
5. „ 25 „ „
6. „ Bearer Unit.
7. „ 23 Inf. Bde.
8. „ 24 „ „
9. „ 25 „ „
10. „ D.A.P.M.
11. „ D.D.M.S. 3rd Corps.
12. „ A.D.M.S. 9 Div.
13. „ File.
14. „ Diary.

Operation orders issued by any formation, high or low, in any branch of the Service, are to be merged, as already stated, under the six headings indicated, and it is frequently necessary for the operation order of a lower formation to embody under the heading "Information" of that order the substance contained under the headings "Intention" and "Method" of the operation order of its superior commander. In other words the "Intention" and "Method" of the superior commander has to be lifted frequently into the heading "Information" of the subordinate commander.

In medical operation orders (divisional) we again come upon a constant as we did in appreciations, for the heading "Intention" would appear to boil itself down to a consideration of the number of medical posts it would be necessary to establish to ensure the evacuation of casualties.

For details of the Narratives, etc., concerning the Exercises set at the remainder of the examination, the reader is requested to turn to page 255 *et seq.* of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS of October, 1926, as space will not permit of their repetition here.

On referring to Narrative 2, which commences on page 255, it will be seen that an operation order was issued verbally by the General Staff of

8th Division to Brigade Commanders, Staff Officers and Heads of Services. It is important to note that it is customary for operation orders given verbally to assume the same form and sequence as similar orders given in writing. For those studying for the examination it would be good practice to convert the above-mentioned verbal orders into the model form of operation orders required by "Abbreviations," including the numbering of paragraphs and sub-paragraphs and the use of the recognized abbreviations, etc.

Narrative 2 introduces Task 3 which, as set at the examination, reads as follows: "As A.D.M.S., 8th Division (*a*) attend the Conference of Brigade Commanders, Staff Officers, etc., and be prepared to state how the evacuation of casualties is progressing, and how long it will take to clear the A.D.S.'s ; (*b*) After the Conference write the necessary orders to Field Ambulances in message form." The task set by para. (*a*) comes under Exercise 4 and that by para. (*b*) under Exercise 2 of the examination.

For the purpose of this article we shall alter para. (*a*) to read as follows: "As A.D.M.S., 8th Division, furnish to 'G' by 09.15 hrs. an appreciation in writing of the situation regarding casualties reported up to 09.00 hrs. from the point of view of how their evacuation is progressing and the time it will take to clear the A.D.S.'s." It will be assumed that the A.D.M.S. has been informed of the gist of the verbal orders given in the narrative which "G" is about to issue at 09.15 hours.

To those familiar with Section 25 of "Training and Manœuvre Regulations," it will be clear that the type of appreciation required here is type (ii) —namely an appreciation of a minor problem in the field, in which rapidity is all important and in which the time available will not admit of all the factors being *recorded*, though they should all receive consideration.

The considerations affecting the attainment of the object in this instance, or more briefly the factors, are of two sources, namely those given in the narrative and verbal orders and those based on the A.D.M.S.'s own knowledge and experience. The following are the considerations derived from the first source and are almost self-evident :—

(*a*) A decision has been made to withdraw 8th Division from its present position and that the withdrawal is to take place by bounds, of which the first is to commence at 10.00 hours on October 21.

(*b*) A glance at the map will show that, during the first bound, the distance on the right sector to be covered by 23rd Infantry Brigade is greater than that to be covered by 25th Infantry Brigade on the left sector; it is in consequence of this fact that the operation order directs that the withdrawal is to be regulated by the pace of the 23rd Infantry Brigade.

(*c*) In view of (*b*) the A.D.M.S. will visualize the problem chiefly from the point of view of the time required to clear the 400 casualties reported on the right sector and, furthermore, his problem will boil itself down to a question of the time required to clear the lying cases among these casualties.

From the second source the following points will suggest themselves to the A.D.M.S.:—

(*a*) In the front line region on the right sector the country is rough and exposed and the distance from the nearest R.A.P. to A.D.S. is about one mile of such country. The time required to manhandle one stretcher case from the R.A.P. to A.D.S. will be about one hour (including the time for return journey of the bearers) even allowing for well-distributed bearer relay posts.

(*b*) The onward passage of the stretcher case from A.D.S. to car post on main road—a distance of one and a half miles—will be by bullock tonga, moving at the rate of about 2 miles per hour. The time required for a bullock tonga to do the round trip will be about one and a half hours. There are twelve such tongas in an Indian field ambulance, so that roughly twenty-four stretcher cases reach the car post every two hours, allowing for a certain amount of transport difficulties involving delays, hold-ups on the track and treatment in the A.D.S.

(*c*) Fighting commenced at dawn—say 06.00 hours; it is extremely unlikely, therefore, that the first stretcher case will have reached the A.D.S. much before 07.00 hours, so that by 09.00 hours it is possible that twenty-four such cases will have reached the car point on the main road, whence their further evacuation will be rapidly effected by motor ambulances.

(*d*) Of the 400 casualties reported up to 09.00 hours in the right sector, twenty per cent. at least will be stretcher cases, so that about eighty such cases have to be evacuated, and this does not take into consideration the strong probability that further cases will occur after 09.00 hours.

(*e*) With the transport at present available, namely twelve bullock tongas in the field ambulance clearing this sector, it will be about 14.00 hours before all the stretcher cases have reached the car point.

Bearing in mind the above considerations, the A.D.M.S. would then proceed to write his appreciation in something after the following manner:—

SECRET.

Urgent.

Place: Advanced G.H.Q.
Time: 09.05 hrs.
Date: 21 Oct.
Copy No. 1.

Appreciation of the situation regarding 800 casualties reported up to 09.00 hrs. on 21 Oct. in 8 Div. from the point of view of how their evacuation is progressing and the time required to clear the A.D.S.'s.

Reference Map, 47 F/10.

Object.—The clearing of all casualties by 10.00 hrs. to-day.

Factors.—(1) As the 800 casualties in question are about equally distri-

buted over right and left sector this appreciation is based on the time required to clear the stretcher cases in right sector, as the intended withdrawal, due to commence at 10.00 hrs. to-day, is to be regulated by the pace of 23 Inf. Bde. in that sector.

(2) Of the 400 casualties on right sector twenty per cent are stretcher cases, so that eighty such cases have to be cleared. With transport at present available in this sector, twenty-four cases can be cleared every two hours and, at the moment of writing, it is calculated that that number of such cases have been evacuated. Wounded in this sector will not be cleared therefore till about 14.00 hrs. to-day, with present transport arrangements.

Plan.

Withdrawal at 10.00 hrs. to-day from present position will involve the abandoning of about fifty lying cases unless assistance can be given during the next hour to manhandle these cases by the troops themselves in this sector.

F.........D.........S.
Colonel,
A.D.M.S.
8 Div.

Copy No. 1 to "G."
2 to File.
3 to War Diary.

The foregoing is an attempt to furnish an illustration of a type (ii) appreciation in writing and, having done so, we shall now revert to the original task in which it was required of each candidate that he, as A.D.M.S., should attend the conference.

The notes in Task 3, given by Colonel Sewell on page 257, etc., show that the board, being in the position of 8th Division Staff, required to all intents and purposes from each candidate a verbal appreciation of the situation in question.

Those who have attended Staff Exercises will remember that the directing staff nearly always insisted that appreciations of situations given verbally should take the same form and sequence as those given in writing, just as they do with regard to the issue of verbal orders. Occasions arise, however, when time demands that the plan or conclusion be rapped out at once, and the frills, so to speak, i.e., the object, factors, etc., avoided. In this case the candidate would be given credit for stating the object, factors and plan as in the written appreciation above, but it is probable that the board would be more pleased with the candidate, who, going straight to the point, states as follows: "The casualties on the left sector can be cleared, but the question at issue is the time required to clear the lying wounded on right sector, of which it is calculated there are about eighty. I estimate that at this moment (09.15 hours) twenty-four of these cases have been cleared, but the balance cannot be evacuated till about 13.30 hours with the transport at present available there. A retirement at 10.00 hours will

involve the abandoning of some fifty lying wounded." A suggestion could be added, as in the written appreciation, to the effect that the troops themselves might lend assistance. The possibility of bringing forward the tongas from 24th Field Ambulance in reserve would only receive consideration to be put out of court, as the time required to do so would be some two hours or more.

We shall now turn to para. (*b*) of Task 3 in which the candidates were required to write the necessary orders to Field Ambulances in message form. This Exercise constitutes a test of the candidate's knowledge of Appendices A and B of "Abbreviations"; being allowed access to the "Field Service Pocket Book," the candidates would be in a position to refer to "Abbreviations." Appendix A, para. v, sub-para. 9 states that reports and messages should always be arranged in the same sequence as that given for operation orders.

The A.D.M.S., having decided upon the tactical method of handling the Field Ambulances during the retirement (see notes to Task 3 on page 258 for same), would then proceed to write his orders in message form. The issue of orders in this way involves a point which frequently appears to present difficulty, namely, how much information is to be conveyed to those concerned? A further point for consideration in this instance is—should the A.D.M.S. embody in the message his orders for the whole retirement, or should he issue separate messages dealing with the necessary bounds? It is suggested that in this case more than one message will have to be issued, of which the first would be as follows (see Appendix B of "Abbreviations" for message form A.F.C. 2128).

To 23—24—25 Fd Amb[1]

Originators Number	Date
M.84.	21

Ref map F 10 8 Div is retiring to line BM 1835 eight milestone road POONA BOMBAY Pt 1944 west of BHAVSARI AAA 24 Inf Bde is occupying this line 14.00 hrs AAA 23 and 25 Inf Bde are retiring at 10.00 hrs first line Pt 1969 Y6312 Pt 2342 bridge river PAUNA at RAOAT second line Pt 1969 E8789 CHINCHIVAD Ry Sta AAA 24 Fd Amb will move to DAPURI and open M.D.S. by 12.00 hrs AAA 23 Fd Amb will conform to movements of 23 Inf Bde route road WIRELESS

[1] *Note.*—As co-ordination is all important in the movement of troops, especially during a retirement, these orders of the A.D.M.S. would be subject, of course, to the approval of "G."

STATION POONA AAA left A.D.S. remains open AAA
M.D.S. will evacuate wounded and prepare to retire AAA
Orders for subsequent moves will be issued to 25 Fd Amb
later AAA addsd 23 24 25 Fd Amb

Time of origin 09.40 hrs.

If sent by wireless the message must be in CIPHER.
If by some other method it may be sent as WRITTEN.

F. D. S.,
Colonel,
A.D.M.S., 8 Div.

The above message should meet the situation involved during the withdrawal to the first line. The time at which the next message should be issued by the A.D.M.S. seems somewhat difficult to decide, as the operation order does not indicate the time of withdrawal from first and second lines. A reference to Narrative 3 will throw some light on the difficulty, as it will show that the final line was reached at 18·00 hrs. by 23rd and 25th Infantry Brigade. The distance covered by these brigades during the retirement was roughly eight miles as the crow flies, so that the withdrawal would be carried out at approximately one mile per hour. The first line would be reached at about 12.00 hours and retirement from same would commence say about 13.30 hours.

A second message would be issued by A.D.M.S. somewhat as follows :—

To — 23 — 24 — 25 Fd Amb.
From A.D.M.S.

Originators Number	Date
M85	21

Ref M84 retirement is continuing at 13.30 hrs AAA
Close left A.D.S. AAA Send all wounded DAPURI AAA
25 Fd Amb less two sections will move to DAPURI route
road POONA BOMBAY AAA Two sections open A.D.S.
KASARVADI by 13.30 hrs AAA addsd 25 Fd Amb rptd
23 and 24 Fd Amb.

Time of origin 12.15 hrs.

Exercise 4 of the test (*vide* Appendix X, King's Regulations) involves the working out of medical arrangements required to meet various military situations. In Tasks 2 and 3 of the scheme under discussion the medical arrangements required were those associated with a retirement. A perusal of Narrative 2 shows that the medical arrangements at issue under Task 4 are those associated with troops holding a defensive position;

similarly Task 5 shows that the requirements in this respect are those associated with troops making a successful attack followed by an advance. The various recognized military situations with the exception of the encounter battle were therefore fairly well dealt with.

It is unnecessary to discuss in detail Tasks 4 and 5, as their solutions are given in Colonel Sewell's article. To those interested, however, it would be good practice to write in modern form (as required by "Abbreviations"), the various orders, messages, drafts, etc., based on these solutions.

The essence of successful map-reading is rapidity, which, as pointed out by Colonel Sewell, can only be acquired by practice.

The writer hopes that this article has thrown some light upon the examination in general, and particularly upon the stumbling-blocks of standing orders, operation orders, administrative arrangements, reconnaisance and the issuing of orders in field message form. With regard to appreciations, his only hope is that he has not left the confounded more confounded.

Editorial.

INTERNATIONAL CONGRESS OF MILITARY MEDICINE AND PHARMACY.

THE Fifth International Congress was held in London from May 6, to May 11, under the Presidency of Lieutenant-General Sir Matthew Fell.

The home of the British Medical Association in Tavistock Square was the Congress centre, the great hall being used for the principal meetings and the extension for the exhibition and writing and club rooms for the members and the ladies accompanying them.

The Congress was attended by nearly 1,000 members. There were delegates from forty countries, as well as from the League of Red Cross Societies and the International Committee of the Red Cross.

On the morning of May 6 the delegates visited Westminster Abbey. In the north transept a procession was formed to the tomb of the Unknown Warrior, where it was met by the Dean and Canons, and a wreath was deposited on the grave by General Rouppert and Inspector-General Lanne.

In the afternoon the Congress was formally opened by the Secretary of State for War, Sir Laming Worthington-Evans, who welcomed the delegates and the representatives of the Red Cross Societies, whose work had done so much to alleviate the horrors of war. Sir Laming said it was an inspiring thought that in the field of medicine the nations of the world had reached a unanimity of aim which was still far to seek in the realm of international politics. The medical services were ranged on the same side against a common enemy, and the cause they served transcended those rivalries which added so much to the statesman's task. In the sphere of military medicine it was possible to meet and exchange freely the fruits of research, secure in the knowledge that they would never be used except in the cause of humanity. "Yours," said Sir Laming, "is an easier task than that of the statesman. You can identify the enemy against whom you are combining. You may not always know whence he comes and whither he goes, but can recognize him as an enemy. The statesmen are in greater difficulty; whilst wishing to combine against war as you combine against disease, they cannot as easily identify the cause of war. You are leading in this matter of co-operation, and I hope the statesmen may follow with equal success."

Sir Laming then commented on the variety of the programme provided for the Congress and thanked the British Medical Association for so generously placing its magnificent hall at their disposal.

The President then gave his address. Sir Matthew Fell said the British members of the Services extended a hearty welcome to their colleagues from all parts of the world. The medical services must necessarily function in accordance with the army organizations of the country they served. These must vary with every army and with the terrain and climate in which operations took place. During the progress of war limits were prescribed by purely military necessity. But the main objects were the

same for all armies—to maintain the high standard of health and to bring to the wounded as rapidly as possible the fullest benefits which medical science could supply.

Those who read the story of medical aid in war could not fail to be struck by two things. The first was the comparatively recent acceptance of the advantages to an army, both in peace and war, of a highly-organized medical service. It was not until the Napoleonic wars that any real advance was made in medical organization. The war in the Crimea gave to history the name of Florence Nightingale and opened to women of education the service of nursing, both military and civil. The Geneva Convention and the vast developments of the International Red Cross had their origins even within living memory.

The second impression conveyed by the study of medical aid in war was the influence of war in accelerating the acceptance of the general discoveries of medical science. The experiences in the Franco-German War of 1870 led those nations who saw their wounded die by the thousand from surgical infections to press forward the principles advocated by Lord Lister, so tardily accepted in this country.

Our terrible losses from enteric fever during the South African War stimulated a brilliant band of workers to elaborate the method of prevention by vaccine treatment, which had proved of benefit to humanity throughout the world.

In conclusion, Sir Matthew Fell expressed his belief that the efforts of statesmen throughout the world to-day to make war impossible were watched by none with more sympathy than by the members of the medical services whose sphere of duty brought them in contact with all the horrors which war involved.

Inspector-General Lanne of the French Army and General Stanislas Rouppert of the Polish Army responded for the delegates.

After these proceedings the delegates and members proceeded to the exhibition, in which the delegates and members spent some time. In addition to the commercial display there was a Service exhibition of the equipment used in the Royal Navy, the Army, and the Royal Air Force. Among the items of special interest of the R.A.F. equipment were the Reid flying aptitude apparatus, Flack's rebreather bag, and the apparatus used to ascertain the effects of rotary movement.

The principal delegates were afterwards received by the Prince of Wales at St. James's Palace. They were presented to His Royal Highness by the Secretary of State for War. After the ceremony refreshments were served in the Picture Gallery.

On Monday evening, May 6, at the Hotel Cecil, a dinner was given by the Government to the principal official delegates and distinguished visitors. Sir Laming Worthington-Evans was in the Chair, and about 120 sat down to dinner. Among British medical men invited to meet the guests from abroad were: Sir John Rose Bradford, Lord Moynihan, Sir

Lenthal Cheatle, Sir Richard Luce, Sir Ewen Maclean, Dr. C. O. Hawthorne, Mr. Bishop Harman, Sir George Makins and Lieutenant-Colonel C. T. Samman (Society of Apothecaries).

After the toast of "The King," and the Sovereigns of the Kingdoms and Presidents of the Republics represented had been honoured, Sir Laming Worthington-Evans proposed the health of the guests. Brief replies were made by General Stanislas Rouppert (Poland) and General Demolder (Belgium). After the dinner, the delegates and members were entertained at an official Government reception at Lancaster House, the guests being received by Sir Laming and Lady Worthington-Evans.

The first session was opened on Tuesday, May 7, and there was a discussion on the evacuation of wounded by water and by air.

Surgeon Commander A. A. Vavasour Elder, D.S.C., R.N.V.R., dealt with evacuation by sea; Group-Captain Hardy Wells, C.B.E., K.H.P., R.A.F., introduced the subject of evacuation by air. A report on this subject was also presented by M. Oudard, Médecin en Chef de 1ere Classe de la Marine Nationale and M. Schickele, Médecin Lieutenant-Colonel de l'Armée Métropolitaine (France). At the close of the discussion, 500 members journeyed to Aldershot, where they visited the R.A.M.C. Training Centre, the Cambridge Hospital, the Dental Clinic, the Army School of Hygiene, R.A.S.C. formations, as well as barracks and regimental institutes. After tea they witnessed on the Central Sports Grounds a gymnastic display by members of the Army School of Physical Training. On returning to London the delegates were guests at a conversazione at the Royal College of Physicians, and a reception at the Royal College of Surgeons. At the College of Physicians the guests were received in the library by Sir John Rose Bradford and Lady Bradford. The band of H.M. Welsh Guards played an attractive programme of music. At the Royal College of Surgeons Lord and Lady Moynihan welcomed the delegates. The Royal Artillery band rendered a selection of music during the evening. Sir Arthur Keith gave a most interesting and instructive lecture on "Design in Nature."

The whole of Wednesday, May 8, was devoted to a visit to Portsmouth, where the visitors were guests of the Lord Mayor and Corporation at the Guildhall, and of the officers at the Royal Naval Barracks. H.M.S. "Victory" and H.M.S. "Hood" were visited, as well as the Royal Naval Hospital, Haslar, and the Submarine depot at Fort Blockhouse.

On Thursday morning, May 9, there was a discussion on tropical fevers of short duration. Lieutenant-Colonel W. P. MacArthur introduced the subject. A paper by M. Gerards (Dutch East Indies) was read giving a précis of the more important diseases of the group, including yellow fever, Weil's disease and dengue and its group of diseases. Short communications were made by M. Sacquepée and Cristao on tropical fevers on the Mediterranean littoral, by Colonel Cazanove on the fevers in the French colonies, and by M. Blanchard, who dealt with African epidemic icterogenic

spirochætosis, a disease resembling yellow fever and Weil's disease. M. A. Cawadias spoke of the epidemic of dengue occurring in South Eastern Europe.

On Thursday afternoon, May 9, about 500 members visited the Halton Camp of the R.A.F. in Buckinghamshire and inspected the R.A.F. hospital and pathological laboratories and the medical training centres. Afterwards a demonstration was given at the aerodrome on the use of air-craft for carrying sick and wounded, and the transfer of stretcher cases from air-craft to ground motor ambulances.

On the evening of May 9 there were two receptions for the delegates. A large party attended a conversazione at the Royal Army Medical College, where they were welcomed by the Commandant, Colonel H. E. M. Douglas, V.C. Another party was entertained at the Wellcome Historical Museum, and was received by Dr. C. M. Wenyon, on behalf of Dr. H. S. Wellcome, who is abroad.

On Friday, May 10, "Injuries to Blood-vessels" was the subject of a joint paper by Surgeon Commander H. E. R. Stephens and Colonel G. De la Cour. A combined paper on this subject was presented by Major Médecin Voncken (Liège) and Médecin Commandant Maisonnet (Val de Grâce, Paris). A large number of speakers took part in the discussion and grateful acknowledgments were made to Sir George Makins for his contributions to the general knowledge of this subject during the war.

At the house of the British Dental Association a communication on the state of the teeth in relation to physical fitness in the different military services was made by Surgeon Lieutenant-Commander J. T. Wood, Captain S. H. Woods of the Army Dental Corps, and Lieutenant-Colonel C. L. Colbran.

Captain Jesus M. Clark gave an account of the dental service in the Cuban Army which he said now possessed dental surgeries inferior to none.

At the Pharmaceutical Society there was a discussion on the physical and chemical analysis of glass and rubber articles used in the medical services. Surgeon Commander F. Lewis Smith and Mr. F. Hooper read paper a describing the available tests.

A paper on this subject was also presented by Farmaceutico Mayor Eleizegui (Spain).

Luncheons were given to the official delegates at the Apothecaries' Hall, to Pharmacists, other than British, by the Pharmaceutical Society of Great Britain and to Dental Surgeons, other than British, by the British Dental Association.

In the afternoon a lecture on evacuation of sick by air, illustrated by a cinematograph film, was given by Major-General F. Bauer (Sweden) at the Imperial Institute, South Kensington.

In the afternoon there was also a reception for the ladies attending the Congress at the Forum Club, Grosvenor Place.

The closing meeting of the Congress was held on Saturday morning,

May 11, and the chief business was the reading in four languages—English, French, Italian and Spanish—of the week's discussions.

These were really summaries by the Committee of the Congress of the leading points which had emerged.

Colonel Van Baumberghen (Spain) reported on certain resolutions which were taken at the session of the Committee on Standardization of the International Red Cross at its meeting in July last. It was agreed on the motion of General Lanne and General Rouppert that the Secretary of the permanent committee of the Congress should be a liaison officer with the Red Cross Standardization Committee.

The chief social event of the Congress was the dinner, on Friday evening, May 11, given by the Corporation of the City of London to the delegates and members. In addition to the Lord Mayor, Aldermen and Commoners, the gathering included the Chief of the General Staff, the Presidents of the Colleges, Vice-Chancellors of Universities, representatives of Government Departments, Presidents of the Medical Societies and of the British Medical Association.

The President of the Royal College of Surgeons proposed the toast of the evening, "Success to the Congress." Lord Moynihan said it was right that medical men should have their day of celebration after a great war, as they of all men knew the cruelties of war, and—with more reason than most men—detested it in all its aspects.

The medical service could claim that they had returned to duty 80·7 per cent of wounded and 93·3 per cent of sick—or more than 16 armies, each of 288,000 men. In times of peace the medical services could also claim great services to humanity. In the story of malaria associated with the names of Laveran of France, Grassi of Italy and Ronald Ross, there was a triple entente engaged in another form of warfare against the enemies, not of one nation, but of mankind.

Lord Moynihan recalled with gratitude the work of Sir Almroth Wright on antityphoid inoculation. The work of Wright and Leishman had saved an army corps for the British Army in France. Lord Moynihan concluded his oration by saying: "Well, my Lord Mayor and brother officers, if there is any meaning behind life, if life is not merely a feast, or a spectacle, or a predicament, but is as I believe a sacrament, we must be sent into the world for the purpose of helping each other. It is because our profession in all its activities is founded on the law of love, love to one's fellows, love to mankind, expressing itself in service, that I ask you to drink to the success of the present Congress."

Three responses were made—in French by General Lanne, in Italian by General Riva and in English by Colonel Seaman of the United States, who took the place of Surgeon-General Cumming.

Sir Humphry Rolleston proposed the health of the Lord Mayor and the Corporation. Sir Kynaston Studd then replied and the proceedings terminated.

Clinical and other Notes.

A CASE OF EPIDERMOLYSIS BULLOSA COMPLICATING MALARIA.

By Lieutenant-Colonel W. P. Mac ARTHUR, D.S.O.
Royal Army Medical Corps.

Mr. B., the subject of this note, is a man, aged 40, well developed mentally and physically, of abstemious habits, and by profession a rubber planter.

I was asked to see him in the early summer of 1928, as he was in ill-health, and described as suffering from: (1) malaria; (2) diarrhœa of uncertain origin; and (3) some undiagnosed skin affection.

Although we are mainly concerned with the last-named ailment, the first must be mentioned because of its effect on his general health, while the intestinal complaint is not without a peculiar interest of its own.

(1) Mr. B.'s attacks of malaria had been severe and persistent, and had left him in a debilitated state, also contributed to by overwork and worry in connexion with the opening up of jungle for new plantations. Otherwise the malaria in itself showed nothing of interest.

(2) He complained of long-continued looseness of the bowels accompanied by "indigestion" and flatulence; he passed several unformed motions daily, he said, but had never suffered from dysentery so far as he knew, nor noticed blood in the stools. He was asked to pass a motion for cultural and other tests, and I was surprised to see that the matter consisted mainly of lumps of food still identifiable, obviously bolted without chewing. The patient was told that before laboratory examinations were undertaken, his ability to digest properly masticated food must be tested, and he was directed to chew each mouthful of food a set number of times until thorough mastication had become a habit. These admonitions were reinforced by an ocular demonstration of the impossible task he had been expecting his digestive apparatus to perform. He carried out his instructions faithfully, with the result that the indigestion and diarrhœa ceased absolutely without other treatment, and did not return.

(3) The patient's skin generally had a thinned and atrophic appearance, and showed the presence of many blisters both serous and hæmorrhagic. These varied in diameter from about one-sixth of an inch up to about two inches, and affected in particular the parts more liable to injury—the hands, elbows, knees and ankles. Those on the hands numbered over twenty, in various stages. I had the interesting experience of seeing one in process of formation. In making a movement one of the patient's fingers brushed lightly against my table. So gentle was the impact that I should have

Fig. 1.

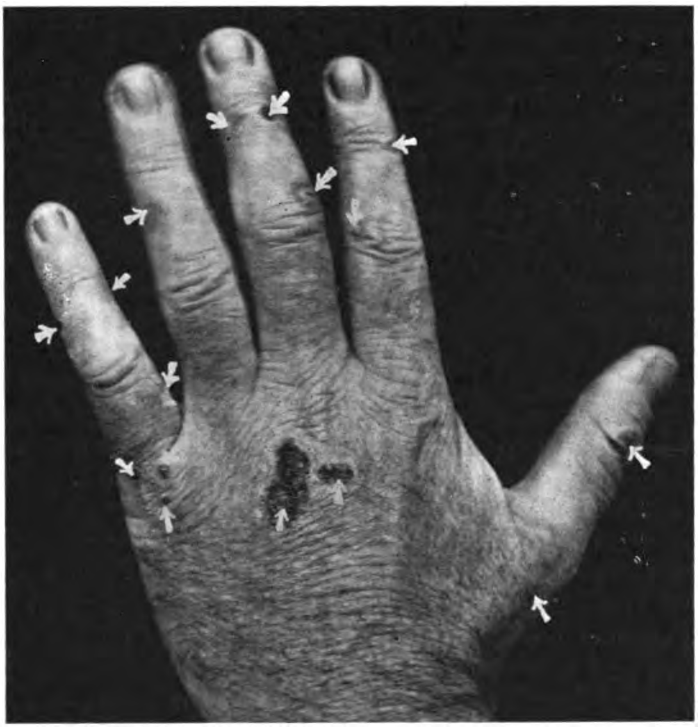


Fig. 2.

Figs. 1 and 2.—"Mr. B.'s hands before treatment was commenced. The lesions with ill-defined margins (in the photographs) are serous blisters."

been unaware of it had not the motion of his hand caught my eye. Almost immediately a blood-blister formed at the point of contact.

Needless to say, Mr. B. found this abnormal sensitiveness of the skin a most serious handicap both in work and play, and a simple procedure like tying up a parcel, or changing gear in a car, left his hands badly blistered, while exercises like golf and riding were out of the question. He found it difficult to enter or leave a bus or taxicab without some reminder of his journey in the form of skin injuries. In short, pressure on the skin to a degree quite inappreciable to a normal person sufficed to cause painful and even crippling blisters. Sometimes these lesions healed up without giving rise to further trouble, but often they became infected, and resulted in painful sores. Altogether the patient was in a pitiable state.

He had noticed the condition commencing, he said, about three years before. At first it was not troublesome, but slowly got worse, and with the onset of severe and long-continued malaria the skin complaint advanced rapidly, seemingly keeping pace with the deterioration in his health. I inquired carefully for a history of other cases in the patient's family; he knew of none in the past, nor on questioning various elderly relatives could he hear of any such. Most suggestively, however, his brother, also a rubber planter in the same country, has developed a similar skin affection while suffering from severe malaria, so that some familial predisposition is evident. (This second gentleman, I have just been informed, has been invalided home because of his skin condition, and is now on his way to England.)

Naturally Mr. B. was most concerned regarding prognosis, and one explained that there was some congenital deficiency of elastic tissue in the skin, obviously not of an extreme degree, else some evidence would have been noticed before, that probably this hereditary weakness had been aggravated by persistent malaria, and that the greater the responsibility of the second factor, the greater the hope of amelioration.

The patient was put on a well-balanced diet, arranged so as to include all the known essential elements, and, in addition, Promonta daily was prescribed. Medicinal treatment consisted of three-day courses of calcium lactate (thirty grains daily) and parathyroid extract ($\frac{1}{8}$ grain daily), alternating with three free days. He was instructed to massage the hands and more exposed parts daily with olive oil in the hope of thickening the epidermis.

There was a steady improvement, and each time that I saw the patient during the summer, or heard from him, he reported continued progress. His last visit was in November, 1928, just before he embarked for his return abroad, and his skin was then free from any lesions. In April, 1929, he writes that "after four months of our hottest and very trying weather, coupled with quite a lot of work," he is fit and well, and that there has been no return of his trouble. He still takes an occasional course of calcium and parathyroid, and also adds certain prescribed salts to the

drinking water, for the reason that in his district this is so deficient in saline constituents as to be practically equivalent to distilled water. It seems a sound precaution to raise the salt content to that of an ordinary drinking water, a measure, moreover, that is most gratifying to the patient.

THE TREATMENT OF RINGWORM OF THE SCALP OCCURRING IN THE CHILDREN OF MILITARY FAMILIES.

By Major H. G. WINTER, M.C.
Royal Army Medical Corps.

Tinea tonsurans is a disease which is very prevalent amongst school children throughout the world; it is not surprising, therefore, that cases are frequently occurring amongst the children of military families. Treatment of the condition is costly and not without danger, and when it occurs in the Army presents a problem which, up to now, has not been satisfactorily solved.

In all cases the hairs are infected right down to the roots, consequently no treatment which does not epilate is of any avail. Epilation may be accomplished by any of three main methods: (*a*) X-rays, (*b*) local applications, (*c*) internal administration of certain drugs.

(*a*) X-rays.

This method is by far the most satisfactory in skilled hands, but it has certain disadvantages:—

(1) A costly apparatus is required.

(2) It cannot conveniently be employed for children under 3 years of age, because such small infants will not keep still long enough.

(3) Markedly inflamed ringworm cannot be treated with X-rays for fear of severe reaction and possible permanent scarring.

(4) The operator must have a great deal of experience of this method; the dose must be exact, as too small a dose fails to epilate completely and a small over-dose may result in permanent alopecia. Even under ideal conditions it is impossible to guarantee complete freedom from accident.

(*b*) Local Applications.

In certain types of ringworm—notably those due to a trichophyton—kerion is apt to form; this is, in effect, a localized inflammatory reaction. As a result of this reaction the hairs are loosened and may fall out, spontaneous cure resulting.

This fact is made use of in treatment of cases which cannot for various reasons be treated by other means.

The hair is cut short and is shampooed with spirit soap daily. After shampoo Adamson's ointment (composed of equal parts of common salt and vaseline) is vigorously rubbed into the whole scalp. When properly applied, the application causes an acute inflammatory reaction of the infected area, leaving the rest of the scalp untouched.

The objections to this form of treatment are that it is not infallible, causes a certain amount of pain and must be done wholeheartedly. It is very difficult to get mothers to carry it out.

(c) Internal Administration of Drugs.

Thallium acetate is the only known drug which, when taken by the mouth, causes the hair to fall out. It was originally used for inhibiting sweat secretion (e.g., in phthisis), and its epilatory property was then discovered.

Thirty years ago Sabouraud attempted to use this salt in the treatment of ringworm, but gave it up as unsafe and concentrated on X-rays. In more recent years Buschke in Berlin worked out the dosage by animal experiment, and Cicero in Mexico was the first to treat cases with it on any scale. Its use is now world-wide in such cases where X-ray is impracticable or contra-indicated.

The pharmacological action of the drug, worked out by Professor W. E. Dixon, is of interest. Briefly, it may be stated that it has no direct action on the hair follicle, but acts through the sympathetic nervous system on which it has an effect analogous to that of strychnine on the central nervous system. As a consequence, only the hair of the scalp, and occasionally of the outer third of the eyebrows, is affected.

Technique.

Dosage.—8·5 mgm. per kilo of body weight with a maximum of 0·3 grm.

Method of administration.—The child must be accurately weighed and the amount of drug required worked out (i.e., a child weighing 3 stone = 19 kilos would require 19 × 8·5 = 0·161 grm.). Before treatment is commenced the urine should be examined for albumin and casts. The drug is given by the mouth dissolved in sugar and water in one dose. It is best to clip the hair short before commencing treatment.

Effect of the drug.—About the seventh day the hair begins to loosen, on the fourteenth it falls with dramatic suddenness and by the nineteenth it is all out.

Unfortunately the infected hairs come out last and, as the new hair commences to grow immediately the old has fallen, reinfection is liable and the new growth must be protected. Buschke's method appears to be the best; he recommends rubbing the following ointment into the scalp twice daily and keeping an oiled silk cap on the head:—

℞	Sulphur	50 gr.
	Ac. salicyl.	10 ,,
	Paraf. alb.	1 dr.
	Ol. cocois	ad. 1 oz.

After epilation, wash the scalp daily with spirit soap and paint with tr. iod. every second day.

Toxic effects.—These are not usually very severe and consist of pains in the joints, especially the lower limbs, commencing in the second week and

lasting a fortnight; transient albuminuria may occur; loss of appetite, malaise and irritability. It has been found that there is a temporary hypo- or achlorhydria and toxic effects may be combated by giving small doses of thyroid and small doses of ac. hydrochlor. dil.

Children under 5 years of age stand thallium acetate treatment well.

Contra-indications.

(1) The presence of albumin or casts in the urine or other evidence of renal disorder.

(2) It must not be given at or after puberty (it is worthy of note that about 90 per cent of cases of tinea tonsurans occurring in England are due to *Microsporon audouini* which tends to spontaneous cure at puberty).

(3) A second dose must not be given under two months.

(4) The total dosage for one patient must not exceed 0·3 grm. whatever the body weight.

General.

The author has used this form of treatment in a number of cases with excellent results, no serious toxic effects being observed; it is, moreover, far less expensive than X-rays.

It is interesting to note that the drug in small doses is a stimulant to hair growth and that re-growth after epilating doses is rapid and very luxuriant.

In a very small number of cases cure of the disease is not completed and in such cases X-ray must not be resorted to under two months for fear of sensitization.

Toxic effects may occasionally be due to impurities and it is essential that only the purest chemical be employed. The supplies used by the author were all obtained from one firm and were made up in two forms: (*a*) Tablets—red, 0·1 grm., blue, 0·01 grm., green, 0·001 grm. (*b*) Sweetened solution—8·5 mg. per cubic centimetre. The latter is the easiest to use as 1 cubic centimetre is required for each kilo of body weight.

The author desires to thank Lieutenant-Colonel H. MacCormac, C.B.E., Honorary Consulting Dermatologist, for his advice and assistance.

RUPTURE OF AN ANEURYSM OF THE AORTA INTO THE PERICARDIUM.

By Major J. M. MACFIE, M.C.
Royal Army Medical Corps.

A man, aged 47, was having lunch with a friend in a club in India. In the course of the meal he began to chew a portion of red chilli, jerked out to his friend, "By Jove, that's hot!" coughed violently, and collapsed forward on to the table. The friend sprang to his aid and raised him up, but found that, to the best of his knowledge, life was already extinct.

Information gained from the friend was that he had known the deceased for many years, but did not know of his having suffered from any serious illness. He had been in the Army, was at the time of his death a member of the Indian Army Reserve of Officers, and was employed as a travelling agent for a large business firm in the Punjab. In the course of this occupation he was constantly travelling, frequently up to the hills and back to the plains, and never complained of disability for duty. Lately he had developed a distinctly religious trend of thought and speech.

To establish the cause of death a partial post-mortem examination was performed, and it was then found that a large fusiform aneurysm of the arch of the aorta had ruptured into the pericardium, which was tense with dark, liquid blood. The whole wall of the arch of the aorta was in an advanced state of chronic syphilitic aortitis, and, in addition to the point where it had ruptured, there were at least two others where a break could not have been long delayed.

Here was a man carrying on his daily work, who must for some time have been in imminent danger of sudden death without, as far as his friends knew, any knowledge of his condition, and in whom the final catastrophe was precipitated by the mastication of a red chilli.

THE COOKING OF LIVER FOR THE TREATMENT OF PERNICIOUS ANÆMIA[1].

By C. E. POLLOCK, M.R.C.S.Eng.

Major-General, late A.M.S.

LIVER as usually cooked soon palls. Being myself an involuntary member of the "honourable company of liverers," and not relishing the prospect of having to eat the same preparation of liver four or five days a week, I set to work to find ways of converting our mainstay of life into an attractive item on the menu. I give the results obtained up to the present, and with further experience I hope to add to the list.

When cooking liver the following general rules should be observed:—

(*a*) Fresh ox liver is more effective than calf liver.

(*b*) The cooking should be short, and the temperature should be kept as low as possible—just sufficient to make the liver seem to have been cooked.

(*c*) No more fat should be used than is actually necessary for each dish.

(*d*) Grilling makes the liver tough.

(*e*) Only a little salt should be used in the cooking; more can be added when it is eaten.

(*f*) Any sweet flavouring, such as chutney, should be used sparingly.

[1] Reprinted from the *Lancet*, September 22, 1928.

SOME RECIPES.

Liver Sandwiches.—The following has been successfully used by friends for a child. Put the raw liver through a mincer and remove any fibrous parts. Spread the minced liver on thinly cut slices of bread and butter, or a piece of toast which has been split in two. In either case use little or no butter. Add pepper and salt according to taste, sprinkle it freely with fresh lemon juice, and a trace of grated onion. A few dabs of Bovril, or a thin layer of grated cooked ham improves the flavour. Finely-chopped pickles may be used in place of ham.

Fried Liver.—Cut the liver into rather thin slices. Put a small quantity of butter, margarine, or a slice of not very fat bacon into the frying-pan and heat to low frying temperature. Cook gently from five to ten minutes to suit the individual's taste.

Dry Curry.—Slice the liver as above. Put into the frying-pan a little butter and a dessert-spoonful of chutney with a squeeze of lemon juice. Heat this while stirring it to a low frying temperature. Roll the slices of liver in dry curry powder and place them in the pan. Cook gently for five to ten minutes.

Liver Purées.—(*a*) Prepare a white sauce. Stir in six ounces of grated raw carrot; if it is coarse, or, if young carrots are obtainable, the same quantity finely chopped. Boil gently for a few minutes. Stir in the minced raw liver and let it stand for three minutes on the warm top of the stove, away from the flame.

(*b*) Prepare a brown gravy, using as little fatty substance as possible. Bring this to the boil, then move the pan away from the flame, and stir in the minced raw liver. Let it stand for three to five minutes. Green peas or finely-sliced young carrots improve the flavour. Serve on toast.

(*c*) Prepare a breakfast-cupful of Bovril or Marmite. Bring it to the boil, stir in the minced liver, and let it stand for a couple of minutes on the top of the hot stove. This is very useful when the liver is required at short notice.

Liver Soups.—Prepare a breakfast-cupful of any of the following soups: Tomato, veal broth, chicken, or rabbit broth. Many others, such as potato soup, game soup, milk and celery soup, make a pleasant variation. Bring the soup up to the boil. Take the pan off the fire, stir in the minced raw liver, and let it stand for a few minutes.

Minced Liver on Toast.—Prepare a tasty gravy flavoured with a sauce such as A. 1 or Harvey's. Chop the liver and cook gently in the gravy for three minutes, spread it on the toast, and serve hot.

Liver and Eggs.—Minced raw liver may be beaten up with milk and eggs and served as scrambled eggs. An omelette may be filled with minced liver cooked slightly in a tasty gravy.

Liver Roll.—Mince together twelve ounces of liver, six ounces of beef (preferably steak), and six ounces of rather lean bacon. Add a trace of

finely-chopped onion. Mix a teacupful of breadcrumbs with the minced liver and bacon. Beat up one egg and stir it into the liver mixture, flavouring the whole with a little tomato sauce. Wrap it in grease-proof paper, and cook in a steamer from one to one and a half hours. Let it get cold and eat it as a sandwich, or in place of cold meat. This is a useful preparation when travelling.

Rissotto.—Boil some rice in the ordinary way. Cut the liver into dice of about half an inch, and cook in a savoury sauce, tomato for preference. Place the cooked rice in a hot dish, making a hollow in the middle. Put the liver into this. If preferred, the liver may be sprinkled with lemon juice and lightly fried. In this case a well-flavoured sauce should be served to pour over the rice. Cooked macaroni may be used in place of rice.

Stuffed Potatoes.—Bake or boil two large potatoes in their skins. When cooked cut off the upper third. Scoop out one-third of the potato. Into the space thus formed put minced liver, previously cooked in brown gravy and well seasoned with ketchup and lemon juice. Mash the removed potato, and use some of it to form a cap to the liver. Place a thin slice of bacon over the top, and put them into a hot oven for three minutes.

Chicken and Liver Fricassée.—Minced liver mixes well with chicken fricassée prepared in the ordinary way.

Toad-in-the-Hole.—Liver may be used in this dish in place of beef. When making the batter stir in a teaspoonful of ketchup. Cold cooked liver and potato salad made with mayonnaise is excellent for an occasional change, but contains too much oil to be used frequently.

With experience other recipes will suggest themselves to the interested cook, and the anæmic brother will bless her ingenuity.

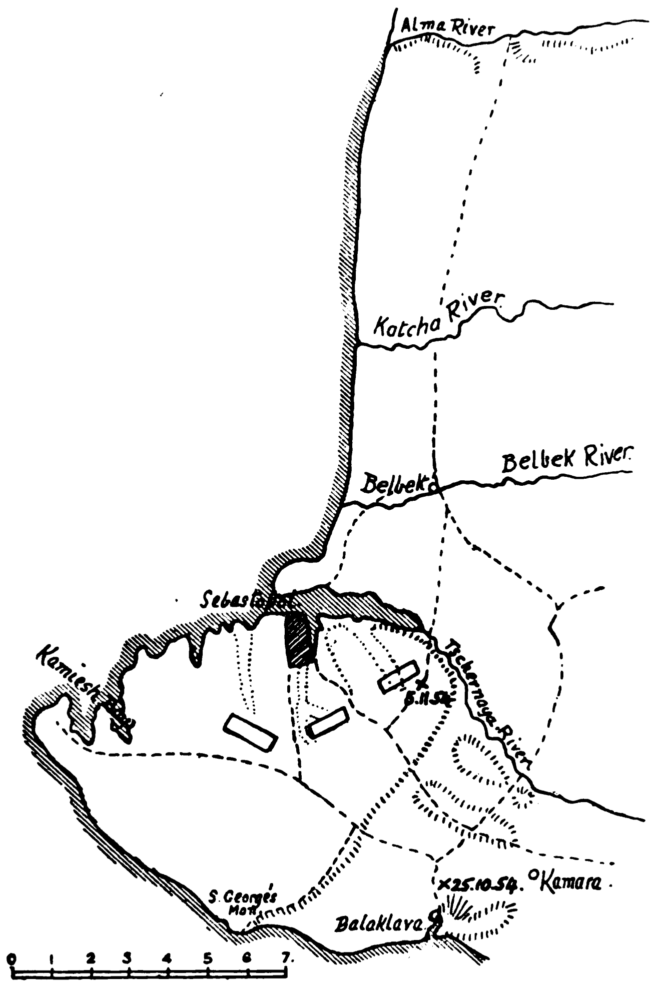
Echoes of the Past.

THE MEDICAL DEPARTMENT IN THE CRIMEA.

By Lieutenant-Colonel G. A. KEMPTHORNE, D.S.O.
Royal Army Medical Corps.

In March, 1854, the Director-General of the Army Medical Department received orders to provide "medical necessaries" for a force of 25,000 men ordered to the East to co-operate with a French army against the Russians, who had invaded the Turkish Danubian provinces. We were embarking light-heartedly on a great European war with an army deprived, owing to successive economies, of the services necessary to maintain it in the field, and administered by a system, evolved in peace time, which under war conditions was quite unworkable. The wagon train had been abolished, supply arrangements had passed into the hands of Treasury clerks, and

the medical service, except as regards the provision made for the regimental establishments, was unorganized for war. The medical staff at this time comprised the director-general, 4 inspector-generals, 11 deputy inspectors, and some 163 officers graded as first-and second-class staff surgeons and assistant staff surgeons, distributed in garrisons all over the world.[1]

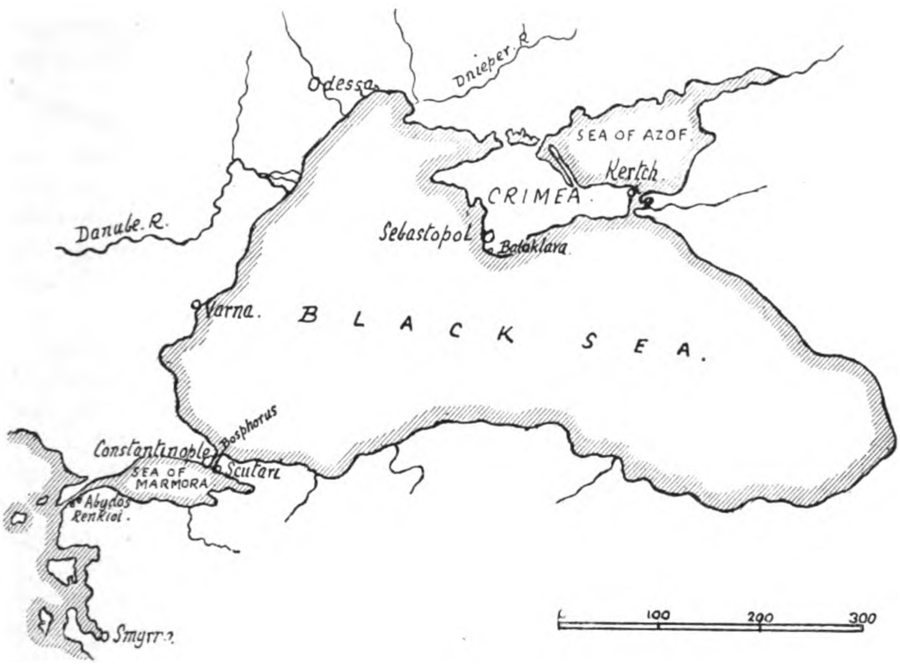


Dr. Andrew Smith, "the able and laborious chief of the united army and ordnance medical departments," as Kinglake described him, had spent the greater part of his army life as regimental surgeon at the Cape, when, on the recommendation of Sir James MacGrigor, he was appointed to succeed him three years before. "He was never over-ruled when nomi-

[1] Staff surgeons were divided into two classes in 1840. Regimental surgeons ranked with second-class staff surgeons.

nating for medical offices and commissions, but in other respects he had little or no authority, and lived always in subjection to several departments of state . . . his powers to command unquestioning obedience from administrators of inferior grade could hardly be said to extend beyond the six desks of his clerks."[1]

In the emergency Dr. Smith called for the office records of the Peninsular War, but none could be found. Medical stores were ordered from Apothecaries' Hall and Savory and Moore, regimental equipment was completed where necessary, and an additional assistant surgeon was given toeach regiment of the force, bringing the number of surgeons up to four.



At the same time deputy inspectors or first-class staff surgeons were appointed to divisions, and three or four staff surgeons or assistants to brigades. For the Inspector-General of the force he chose Dr. John Hall who had had some recent war experience as Chief of the Medical Department in South Africa during the Kafir War, where he had won the approval of McGrigor and the confidence and friendship of Sir Harry Smith, the Commander-in-Chief. He had to be brought home from Bombay, where he was now serving, and consequently arrived unduly late. Two senior officers, David Dumbreck and William Linton, were despatched at once to Bulgaria to study the diseases of the country.

Dr. Smith then proceeded to point out that a corps of able-bodied men

[1] Kinglake, "The Invasion of the Crimea."

would be needed to carry the wounded off the field, that ships properly fitted as ambulance transports must be provided, and that a fighting kit should be authorized for the soldiers in place of their full dress. The first was so far accepted that a *Hospital Conveyance Corps* was hurriedly got together and provided with some ambulance wagons designed by Dr. Smith himself. It was not composed, however, of able-bodied men, but of aged pensioners and others considered unfit for the combatant ranks. The two latter recommendations were ignored.

By May the expeditionary force had arrived in Turkey. The 3rd Division was camped on Gallipoli, the 1st, 2nd, Light Division, and cavalry round Scutari. Each division was about 5,000 strong, consisting of 2 brigades, each of 2 battalions, and 2 field batteries. At Scutari the greater part of the Turkish military hospital was handed over to our use, but, so long as the Army remained there the sick were treated in their regimental hospitals.

In June, the French having arrived, the armies moved to Varna, on the Black Sea, one of the French divisions by land, all the remainder by ship. The sick left behind were transferred to the General Hospital, mentioned above, which was allotted for 800 patients. This was in charge of Deputy Inspector Alexander Menzies, who, in virtue of his seniority, became P.M.O., Scutari.

While the move was in progress, Dr. Hall arrived from India. The staff had left, and there was no one to enlighten him as to how the military situation was likely to develop. In any case, proposed military movements were not considered the doctor's business. He was informed that money had been allotted to convert the lazaretto at Abydos on the Dardanelles into a military hospital, and he urged that the work should be started.[1] He also recommended that part of the great Turkish barrack at Scutari should be cleaned out and made ready to receive patients. Two hulks anchored off Scutari were to be provided for convalescents.

Reaching Varna on June 27, he found between 40,000 and 50,000 men encamped in the neighbourhood. The Russians had retired across the Danube and no fighting was in prospect. He found much to criticize in the position of the camps of some of the British troops, which were on malarious ground near the lake, but, on Lord Raglan submitting his remarks to the divisional commanders, they alleged military objections to moving. The Army remained fairly healthy, however, until the middle of July, when cholera appeared. The disease had started on the French transports in the Mediterranean, had been present among the divisions quartered on Gallipoli, and had pursued them on their march through Bulgaria. At this time they had already had 10,000 cases. By August 19 we had lost 532 men, and the infection had spread to the Fleet. At the

[1] The sites appear to have been selected by the British Consul with a view to operations in Bulgaria.

same time many cases of malaria and dysentery had occurred. The Fleet put to sea, and the camps were moved. By the first week in September the outbreak had subsided, but the men generally were greatly debilitated. The prospect of a move to the Crimea, which by this time was being openly discussed, was welcomed by the officers generally, including the doctors, as affording a cool sea voyage and a removal to a healthier shore. Dr. Hall, in a private letter home, wrote, "Whether we shall go or not I cannot tell; certainly the men might as well be killed there as die of cholera here." He then made his will.

The troops' rations were increased from 1 pound to 1½ pounds of meat a day, and rice was added.[1] Contrary to his own convictions, but in deference to the opinion of others, the Inspector-General concurred in recommending a rum ration. Many of the medical officers considered it would prove a valuable remedy against cholera, and it was issued freely during the campaign. It was only late in the war that any attempt was made to improve the methods of cooking. Food was disgracefully prepared in most units, and this contributed to ill-health.

The ambulance corps, consisting of three officers and 300 men with their wagons, arrived at Varna towards the end of July, where their senility and habitual drunkenness at once excited unfavourable comment. They were not employed at the landing in the Crimea, but, after losing twenty-five of their number from cholera, they eventually reached Balaklava by sea. Some of them were present at the battle of Inkerman, where one was reported seriously wounded, after which they are no more heard of. Their transport vehicles included twelve large ambulance wagons, designed by the Director-General, which later found their way to the front, and did good service until they were wrecked in the Crimean mud. Each provided for six patients sitting and four stretcher cases, and was drawn by six mules. The driver wore artillery undress uniform. The objection to this wagon was its great weight.

On July 16 Lord Raglan received a despatch from the Home Government suggesting that the allied armies should invade the Crimea and occupy the naval arsenal of Sebastopol. Though hardly anything was known either of the force of the enemy or of the nature of the country, the Commander-in-Chief considered it his duty to fall in with the wishes of the Cabinet, and began to make preparations accordingly, in concert with Marshal St. Arnaud and Admiral Dundas, who commanded the British Fleet.

As soon as it became obvious that some such operation was contem-

[1] The normal ration was bread 1½ pounds or biscuit 1 pound, and fresh or salt meat 1 pound. For this the soldier was stopped 3½d. Sugar ¾ ounce and green coffee 1 ounce were added, with an additional stoppage of 1d. The rum ($\frac{1}{32}$ gal.), was a free issue; an extra tot was given in the trenches. After October green vegetables were ordered to be issued, but the supply was very irregular. Lime juice was served out in February.

plated, but in entire ignorance of any details, Dr. Hall submitted a list of medical requirements "in the event of the Army embarking in force." These included 336 canvas stretchers, each with 2 bearers, of which 432 were to be found regimentally and 240 by the ambulance corps; 2 large store wagons for the headquarters of each division, with 2 smaller ones for each brigade; for each regiment a spring cart or wagon, and a pack horse to carry the medical panniers. The large store wagons were to be in charge of a purveyor's clerk at headquarters, and to contain a reserve of medical comforts, tents, and bedding. He also recommended that a number of steamers should be fitted up as hospital ships. The twelve large ambulance wagons he also assumed would accompany the force.

The plan, however, worked out by Lord Raglan's staff, and not apparently communicated to the Head of the Medical Department, involved a landing on the open beach, a rapid advance on the town and an immediate attack from the northern side. No base was to be formed on landing, and no communications in rear kept up. The Army would, however, be more or less in touch with the Fleet during the march, which, given suitable weather, could approach the coast at the exits of the rivers, land supplies, and take off sick. Transport to be embarked was cut down to an absolute minimum. Two steamers, the "Cambria" and the "Andes," ordinary transports, were told off as hospital ships, but during the voyage out were used for the conveyance of troops and were not specially prepared or fitted for the purpose. The steamer "Kangaroo," with a sailing ship in tow, was provided for immediate needs. The Inspector-General was given little detailed information about the dispositions made by the Quartermaster-General. Of the medical transport, the ambulance wagons appear to have been actually embarked, but were put back on shore before the ships sailed. It is probable that the naval officers considered them too unwieldy to land on the beach.

Laying aside the possibility of the Army leaving the coast, which it actually did, and the cholera outbreak on landing, the transport asked for, had it been provided, might reasonably have been expected to provide for casualties on the march and carriage to the ships' boats, though difficulties were increased by the French taking the seaward flank and making our line of march always two to four miles from the shore. While somewhat differently organized, it was roughly equivalent to that provided in the latter days of the Peninsular War.

As regards the medical officers who accompanied the troops, in addition to the 4 with each regiment, each division, consisting of 2 brigades or 4 regiments of infantry with a proportion of artillery, had a medical staff of about 7 officers. This included provision for sick convoys, for a certain number of surgeons who might have to be left behind temporarily with the sick and wounded, and for a nucleus staff for such general hospitals as might have to be formed.

The directions issued by the Inspector-General for the regimental

medical staff were that, when the troops advanced to the attack, one assistant surgeon should follow to render first aid, while a second should supervise the carriage of the wounded back to an aid post, formed out of musket range by the surgeon and the third assistant. Should the advance be continued after the engagement, the surgeon, with at least one assistant, was to follow up the regiment, leaving one or two assistants to aid the divisional staff who would pitch the reserve marquees. Some advice on the treatment of wounds followed, and then some rather unfortunately-worded remarks on anæsthetics, which caused considerable comment in England: "Dr. Hall takes this opportunity of cautioning medical officers against the use of chloroform in the severe shock of serious gunshot wounds, as he thinks few will survive when it is used. But as public opinion, based on mistaken philanthropy, he knows is against him, he can only caution them and entreat that they will narrowly watch its effects, for, however barbarous it may appear, the smart of the knife is a powerful stimulant, and it is better to hear a man bawl lustily than to see him sink silently into the grave"!

The 4th division having arrived from England, the two armies were embarked and assembled in Baljik Bay on September 7. The troops marching down to the harbour brought with them 2,000 sick, some of whom found admission to the general hospital in the Turkish barracks, others were sent to Scutari, and the remainder were put under canvas. As no time-table or order of embarkation was communicated to the medical authorities, some of the ships had several medical officers on board, others none. In some of the latter cholera cases occurred during the voyage. In two of the ships there were thirty-three deaths.

On September 14 the troops began to land on a narrow strip of land between the sea and Lake Kamishlu, six miles north of the Bulgenak River and thirty miles from Sebastopol. The landing was unopposed. The transport mules for the first ammunition reserve accompanied the force, and sixty carts for supplies. For the rest, it was hoped to secure country carts on landing. Three hundred and fifty were obtained, and of these five bullock wagons were handed over to the I.-G. for his medical stores. No transport, medical or otherwise, was allotted to regimental units, but some of the field officers managed to secure ponies for their kit. Owing to bad weather it was five days before the landing was completed. The first night on shore the men, who were without tents, got wet to the skin. The soil was sandy and barren, and the shallow wells which were sunk no doubt became quickly contaminated. Numbers of fresh cases of cholera occurred, including several in the regiments of the 4th Division, which had never landed at Varna and had arrived in good health. Between seven and eight hundred men were re-embarked. The march commenced on the 19th. The men wore the regulation full dress tunic with tails, serge trousers and ankle boots, pipe-clayed cross belts, stocks and heavy shako. The officers were

equally unsuitably dressed in tight coatees, with gold wings on the shoulders.[1] Packs had been left on board, but each man started with a great coat, blanket, socks, and spare pair of boots. Both officers and men had three days' supply of salt pork and biscuit, and, besides their canteens, had their Flanders kettles with them.

The 21st Royal North British Fusiliers, one of the units of the 4th Division landed with its surgeon, David R. MacKinnon, 3 assistant surgeons, and all its medical equipment complete; 2 marquees, 36 sets of bedding, hospital canteens, medical comfort chest, store chest, fracture box, pair of medical panniers, pack saddle, and 8 stretchers. All except the comfort box, panniers and stretchers were re-embarked. The last were handed over to the bandsmen, who were already cumbered with their instruments, and the panniers and comfort box were loaded on to a private ox wagon belonging to Sir George Cathcart, the divisional general, while the surgeons filled their pockets with what stuff they could carry with them.

The regiment had already had five deaths from cholera, and two more occurred that day. The march was parallel with the coast, the French right resting on the sea, their flank covered by the Fleet. The weather was hot, and the want of the water mules was severely felt. On reaching the Bulgenak River, where the army bivouacked for the night after a six-mile march, there was a general stampede for water. The line of march was strewn with discarded blankets and great coats. Men who fell out were left by the wayside in the vain hope that they might be brought on by the ammunition wagons. The Cossacks hung about the left flank and rear. During the day our cavalry screen was in touch with the enemy.

The Russians had taken up a position on the chain of hills rising from the left bank of the Alma River. This position was assaulted by the Allies the following day. The French attack was misdirected, the brunt of the fighting being borne by the British infantry, who advanced over a front of about two miles in line. The battle lasted from 1.20 to 5 p.m., when, after severe and incoherent fighting, the enemy retired in disorder. Our casualties in a force of 25,000 were 362 killed and 1,621 wounded.

The position of the medical officers during the battle seems to have been according to the instructions previously issued. The aid posts of the assaulting battalions were advanced to the river bank, the bandsmen acting as stretcher bearers. The first man killed was a drummer who was carrying a stretcher. "He was struck by a round shot which bounded slowly

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[1] Designs had already been brought out for replacing the swallow-tailed coat by a tunic. The regimental medical officers wore the same dress as the combatants, except that they had black instead of gold lace. In November the uniform of the staff surgeon was ordered to be a tunic or frock with a slight display of gold lace, facings and cuffs black velvet. Trousers black with a narrow gold cord, or, in undress, a scarlet stripe. Cocked hat with a small green plume. The R.M.O.'s were to have an almost similar uniform, but with regimental facings. [Vide *Lancet*, November 18, 54.]

along the ground and hit him with a peculiar squashing sound on the hip. He fell broken in two, and never moved again."[1] The wounded, among them several of the Russians, were collected in a vineyard where two of the three marquees were pitched. But the majority of the wounded were laid out in rows on straw in an open yard. The divisional P.M.O.'s were busily occupied as consulting surgeons, and in performing capital operations. The whole of the administrative arrangements seem to have been dealt with personally by the Inspector-General. There were, of course, no operating tables. Alexander, of the Light Division, considered himself fortunate in securing a door which had been taken off its hinges, but most of the operations were done on the ground. As the work of dressing wounds and amputating limbs was completed, the patients were removed to the shore, some three miles off, a medical officer stationed at the exit of the enclosure having first satisfied himself that they had been attended to. Meanwhile, men were still coming sick with cholera. A thousand blue-jackets were landed from the Fleet with stretchers and hammocks, one or two arabas were made available, and some ponies with cacolets were borrowed from the French, who themselves had few wounded. It was the evening of the 22nd before the work was finished, during which time the whole Army remained bivouacked on the heights.

The embarkation of the wounded was carried out under the superintendence of the naval doctors. Two of the transports had been supplied with medical and surgical appliances and stores, and two medical officers each. Others for which there were no preparations made were now requisitioned. The special correspondent of the *Lancet* volunteered to proceed to Scutari on the "Colombo" with 650 wounded and sick. The three surgeons on board spent the whole voyage cutting off arms and legs.

The burial of the dead was entrusted to the 4th Division troops. The Colonel of the 21st, in a letter to his brother wrote: "We remained behind to bury the dead, and what with the putridity of the battlefield, the terrible damps at night and heat by day, we suffered severely from cholera. We landed 901 rank and file, but we have now not 700, all the rest either sick or dead." They had been on the extreme left during the battle and had only one casualty.

On the morning of the 23rd the Allies advanced seven miles to the Katcha River. When the rearguard marched, the Russian wounded, of whom some 500 remained on our hands, were left, after having been collected at one spot. One assistant surgeon, Thomson of the 44th, was detailed to do what he could for them. His only assistant was his batman. If their condition was anything like that described by Kinglake, it reflects badly on our medical organization, though the cholera epidemic with the casualties among our own men from the battlefield, we may well believe, kept the medical staff working at high pressure. As it was, the 500 Russians

[1] Russell.

and two Englishmen were left three days and three nights on the ground. "From time to time during those three days, and to the utmost of their bodily strength, Dr. Thomson and his servant laboured to part the dead from the living, to heave the corpses away, and get them more or less underground; but, when at last succour came, our seamen had to lift out as many as thirty-nine bodies, some in part decomposed, before they could get at the living."[1] The wounded Russians who survived were handed over to the Governor of Odessa, under a flag of truce, in the most miserable condition. Dr. Thomson paid the penalty for his devotion. He contracted cholera, and died on landing at Balaklava.

Among the medical officers present at the Alma, six rose to be Director-General. Thomas Alexander, of the Light Division, James Brown Gibson, the Duke of Cambridge's personal medical attendant, T. G. Logan, of the Highland Brigade, W. M. Muir, T. Crawford, and W. A. Mackinnon, the last three regimental surgeons. Among others who subsequently rose to fame was Thomas Longmore, surgeon of the 19th Foot. Except for a reference to the Inspector-General, the services of the Medical Department during the battle were ignored in Lord Raglan's despatch, a fact which caused some comment. Sir James McGrigor, who in his retirement followed with the keenest solicitude the fortunes of the Department, secured a small pension for Thomson's mother, and by his efforts a monument was put up to his memory.

On Sunday, September 24, a further advance of six miles was made, and from the high ground between the Katcha and the Belbek Rivers the men looked down on Sebastopol. The night was spent among the fruit gardens and orchards of the Belbek Valley, within gunshot range of the suburbs. The French were now, however, unwilling to face an immediate assault on the northern defences, and it was decided to march round to the south of the town. The 4th Division remained a further twenty-four hours on the Belbek as a covering force, while Lord Raglan led the remainder of the troops by a twelve-mile march as far as the valley of the Tcheinaya. The sun was hot and the distress of the men very great, numbers being left by the roadside. Meanwhile the main Russian army was evacuating the town, leaving its defences to the sailors of the fleet. The two armies, each intent on its own purpose, crossed each other's front without realizing it and narrowly escaped collision.

The sick left behind on the 25th were sent back from Belbek to the mouth of the Katcha River in some empty transport carts which now became available, and got through unmolested. The safe arrival of the convoy was due to good luck and the presence of mind of one of the medical officers, Surgeon Inlong, who was being evacuated as a patient. A party of Cossacks at one period of the journey were bearing down on them when this officer

[1] Kinglake.

turned out all the most able-bodied of the sick and brought them into military formation, on which the cavalry made off.

On the 26th the port of Balaklava was occupied, and positions were taken up on the heights above the town of Sebastopol on the south. Here Cathcart's troops joined the force, among them the 21st Fusiliers, some of whose experiences have already been recounted. During their march the cart on which the panniers and bell tent had been loaded was continuously behind. Two nights it failed to turn up at all, when the C.O. and second in command gave up their private tents. The comfort box was thrown off to lighten the load. Of those who fell out, twenty-nine men were entirely lost sight of and were returned as missing. The admissions recorded in the books of the regimental hospital for the last fortnight of September were 181. Of these 130 were for cholera, and there were 27 deaths.

Among the senior officers of this regiment was Lord West, a soldier much in advance of his time, who succeeded to the command after the Colonel was killed at Inkerman. He gave his views on certain aspects of the medical services to the commission which sat in 1856. He referred to Surgeon McKinnon as one whose unremitting attention to his duties during the campaign deserved the highest praise. His only criticism was that, as surgeon, he had too little disciplinary control over his assistants, and expected the C.O. to issue his orders for him. This probably might have been said of most of the other regimental surgeons before Sebastopol ; for at a time when medical officers enjoyed officially no power of command at all, it is not surprising that the surgeon should have been regarded by the assistant surgeons more in the light of a senior partner than a commanding officer. In Lord West's opinion the surgeon should be treated in every respect as a field officer, even to the extent of granting him substantive rank if necessary. He stated that he never got any help from medical inspecting officers, who seemed to possess no powers whatever.

The victory of the Alma gave the Allies the run of the Crimea with all its resources to draw upon, could they have availed themselves of it. Had it been followed up at once there is good reason to believe that they might have entered Sebastopol on the heels of the retreating and demoralized army. Even after the flank march, a determined concerted attack might have carried the town. But this was not to be. They sat down in a corner with their backs to the sea, a fortress on one side, whose strength, under the genius of Todleben, was daily increasing, while the enemy's field army was reorganizing itself for an attack on the other. They were in fact besieged themselves. All supplies for the British Army had to be collected overseas and brought to the little harbour of Balaklava, where there were the poorest facilities for unloading, and none for storage.[1] The position on the heights, where the troops were now engaged in throwing up defences,

[1] The French base was at Kamiesh Bay and was far the best of the two.

was seven miles away, and the connecting road a mere track, impassable after heavy rain for wheeled traffic. A general hospital for about 100 patients was formed in the village school at Balaklava, but the main source of medical aid was to be looked for in the regimental establishments on the heights. Here the surgeons laboured under great difficulties. There was most inadequate shelter for the sick, and no medical store depot nearer than Balaklava. The 21st received thirty-two bell tents about ten days after their arrival, of which one was allotted to the hospital. They also had a share of the divisional marquee. It was not until December that one of their own marquees was recovered from the ships, and the surgeon was able to utilize the twenty field-cots and mattresses he obtained towards the latter end of October. The sick were meanwhile left in their own overcrowded tents. Fortunately, for the first four weeks the health of the men showed an improvement. There were 198 admissions and only seven deaths.

The work in the trenches was most severe. The nights in bed worked out at five in fourteen. There was no water for washing, the vermin on the men's bodies is described as being as thick as writing on the page of a letter. The fuel on the spot was soon exhausted. In the absence of camp kettles, discarded on the march, many men consumed their pork raw rather than going to the trouble of cooking it in their mess tins. Nevertheless they kept cheerful, sustained by the hope that the siege train, when it arrived, would make short work of the Russian defences.

Despite allegations to the contrary, there seems to have been no scarcity of medical officers to attend the sick and wounded at the front. The number with the divisional troops was, in fact, not far short of that at the present day, and considerably greater than in the Peninsular war. The obvious disadvantage of the regimental system was that, during active operations, while some were entirely idle, others might be overwhelmed with work.

The advance on Sebastopol was planned as a raid. The distance was only thirty miles. Success and even the safety of the armies depended on speed. The sacrifice of transport for sick and medical stores on military grounds would have been amply justified by success. The enemy, thanks largely to incompetent leadership, was badly beaten in the field, but the victory was not followed up, and a movable column was set down to carry out a winter siege. Owing to the lack of forethought which characterized the whole undertaking, it was weeks before it could be properly equipped for the purpose. In the interval, sick and able-bodied alike had to endure intense misery.

All provision for the sick was rendered extremely difficult by the isolated position of the different departments, including the Naval Transport Service, which were concerned in dealing with them. The Inspector-General had no power of independent action in his association with these departments, and the staff had not the ability, or in some cases even the

power, to co-ordinate their work. To this must probably be ascribed the muddle in arranging for and equipping the hospital ships, the shortage of medical officers in some of them, and the mislaying of medical stores. Apart from this, however, the Head of the Medical Department never seems to have received timely information regarding proposed military movements or to have been given much chance of advising or providing for future eventualities. This point was raised during his examination before the Royal Commission, but conveniently shelved.

(*To be continued.*)

Current Literature.

REGISTRAR-GENERAL, ENGLAND AND WALES. **Statistical Review of England and Wales for the Year 1926. (New Annual Series, No. 6.) Text.** Pp. vii + 167, 5 diagrams. 1928. London: H.M.S.O. [5s.]

This volume is a general review of the vital statistics for 1926 published by the Registrar General in " Tables, Part I Medical " and "Part II Civil." (This *Bulletin*, 1927, v. 2, 1018).

From 1861-65 till the end of the century infant mortality did not fall at all. Since 1900 the mortality has declined to less than half. Reduction has been much greater in later than in the first month of life, each of the higher ages record a fall of about 50 per cent. since 1906-10 against 21 per cent. in the first month. The fall of 8 per cent. in total infant mortality in 1926 as compared with the preceding quinquennium was chiefly due to a decline in mortality from bronchitis and pneumonia, congenital debility, premature births and convulsions. A decline of 74 per cent. since 1901 in mortality attributed to congenital debility was probably largely due to transference of certification to premature birth.

Maternal mortality has remained practically stationary during the last 16 years. The birth rate of 17·8 per 1,000 population was the lowest on record with the exception of the worst of the war years, 1917 and 1918. The present fall "has no doubt been occasioned by the same cause as was responsible for much of the decline in the marriages of 1926, viz., the prolonged coal dispute of that year, and its effect may therefore be of a temporary nature only." The birth rates of England and Wales since 1911 are compared with those of other European countries.

The fatality rate for enteric fever in 1926 was lower than for any year except 1924. The fatality rates for scarlet fever and poliomyelitis in 1926 were the lowest since 1911 and those for smallpox and diphtheria were much the same as in 1925 and lower than in any preceding year. The age distribution of measles mortality in relation to geographical area is discussed. Almost two-thirds of the deaths occurred during the first and second years

of life, and this proportion increased regularly from a rural minimum to a County borough or (in the South) London maximum.

The standardized mortality from tuberculosis of 942 per million was for the eighth year in succession the lowest yet recorded. Compared with 1912-14 mortality from tuberculosis in 1926 declined at every age group for males but for females there was an increase of 4 per cent at ages 20-25.

The excess mortality from cancer of males over that of females still persisted in 1926. Comparative figures show that since 1911-20 the male mortality from accessible sites increased 7 per cent. whereas inaccessible sites were responsible for an increase of 17 per cent. There was little change in the rate for female mortality from accessible sites, and mortality from inaccessible sites increased 8 per cent. For both sexes alike there was no evidence from a comparison of accessible and inaccessible sites in favour of the reality of the recorded increase. "The more recent data are consistent with the view that it is due to improvement of diagnosis, but of course they do not prove its truth. It may indeed be argued that as lives are undoubtedly now being saved in increasing numbers by modern methods of treatment, the mortality of females from accessible cancers, which is that mainly affected by this consideration, would not be stationary, but definitely decreasing, if the frequency of cases remained unchanged." Cancer of the tongue was selected for special study as a test of the reality of recorded increase of cancer.

It is shown that the reversal of the sex ratio of mortality from diabetes (first noted in 1923) is not a new phenomenon of the disease but merely a stage in a change which has been continuously in progress for over 60 years.

Mortality from cerebral hæmorrhage is examined in some detail. Precision of statement in certification of death is having some effect upon mortality statistics. The increase of recorded mortality from diseases of the heart and arteries appears to be largely dependent upon changes in certification, e.g., arterio-sclerosis is replacing "old age" in death certification. The rapidity with which the term "pneumonia" (not otherwise defined) is disappearing from death certificates is also an example of the growth of this precision. Mortality from ulcer of the stomach or duodenum has risen considerably since 1911 for males but there is no such increase in female mortality.

Since 1915 it has been customary to make a special report upon methods of certification every fifth year. The proportion of certified deaths in 1925 was 92·08 per cent., inquest cases 6·91 per cent., and uncertified deaths 1·01 per cent. Inquest cases and uncertified deaths are tabulated by sex, age, class of area and assigned cause of death.

H. M. WOODS.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

REGISTRAR-GENERAL, ENGLAND AND WALES. **The Registrar-General's Statistical Review of England and Wales, for the Year 1927. (New Annual Series, No. 7). Tables. Part I. Medical.** Pp. iii + 497. 1928. London: H.M.S.O. [15s.]

The birth rate for 1927 was 16·6 and the death rate (crude) 12·3 per 1,000 population. The birth rate was the lowest recorded since the establishment of registration in this country; the death rate was slightly higher than for any year since 1922. The standardized death rates for 1927 compared with the previous year were as follows: persons 10·6 (10·1 in 1926); males 11·8 (11·2); females 9·6 (9·1).

The deaths of infants under one year was 70 per 1,000 births, the same as for the previous year. Infant mortality distributed by age for the year under review was :—

	Per 1,000 births
Under 1 month	32·3
1-3 months	10·8
3-6 ,,	9·7
6-9 ,,	8·7
9-12 ,,	8·2

The deaths of illegitimate infants declined from 130 per 1,000 births in 1926 to 120 in 1927. Deaths from premature birth were the highest of the separate causes of all infant deaths.

The mortality from infectious diseases differed little from that for the previous year, except mortality from influenza. The death rate from influenza of 567 per million living was the highest recorded since 1918-19. The mortality rates recorded in earlier epidemics were as follows: 1922, 563; 1919, 1,181; 1918, 3,078; 1900, 504; 1892, 533.

The death rate from cancer was 1,376 per million persons or 14 per million higher than in the previous year. The increase was mainly in male mortality.

	Death rates per million			
	Males		Females	
	1926	1927	1926	1927
All forms of cancer	1,307	1,332	1,413	1,417
Buccal cavity	137	144	21	21
Pharynx, œsophagus, stomach, liver	485	486	380	366
Peritoneum, intestines and rectum	315	317	296	294
Female genital organs	—	—	284	287
Breast	2	2	260	277
Skin	44	44	21	23

Mortality from diabetes in females continues to exceed that of males, 142 against 109 (124 and 106 in 1926). The increased mortality from tuberculosis, heart and respiratory diseases may be partly due to the prevalence of influenza. The death rate from ulcer of the stomach or duodenum has steadily increased in males from 88 in 1921 to 158 in 1927. For females the rate has varied from 42 in 1921 to 49 in 1927. There were 4,907 deaths from suicide, giving a death rate of 125 per million; the rates in

the three preceding years were 95, 105 and 114. The increasing use of lysol and coal gas as a means of self-destruction is shown in the following statement of registered deaths :—

	Lysol	Coal gas
1919	7	213
1920	11	270
1921	32	361
1922	56	496
1923	86	684
1924	110	582
1925	153	753
1926	261	940
1927	361	994

Deaths on railways numbered 466 against 419 in 1926, while deaths from mechanically propelled vehicles increased from 3,412 in 1925 and 4,075 in 1926 to 4,492 in 1927. It is difficult to institute comparison between the deaths from the several kinds of vehicles owing to the cases in which two or more different types of vehicles were involved and the verdict failed to indicate which vehicle was in fault. Of the cases where death was caused by one vehicle only, it is of interest to note that the deaths from motor-omnibuses, cabs and tramcars were approximately 20 more than in 1926 ; of the deaths from other types of vehicles those from motor-cycles increased from 543 and 783 in 1925 and 1926 to 940 in 1927, and motor-cars from 987 and 1,173 to 1,292.

The number of cases of scarlet fever notified during 1927 was 84,450, giving an attack rate of 2·16. The corresponding figures for diphtheria and enteric fever were 52,011 and 3,533, and the attack rates 1·33 and 0·09 respectively.

H. M. Woods.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

Holwerda, K. **On the Control and the Degree of Reliability of the Chlorination-Process of Drinking-Water, in Connection with the Chloramin-Procedure and the Chlorination of Ammoniacal Water. (First Part.)** *Meded. Dienst. d. Volksgezondheid in Nederl.-Indie.* 1928, v. 17, 251-97. [20 refs.] [Lab. of Purification of Water, Manggarai.]

In much of the published work on the sterilizing effect of chlorine no account is taken of the chemical condition of the active chlorine or of the effect of reducing substances present in the water, so that the length of time a given concentration of chlorine is active is not known. It is considered that destruction of *Bact. coli* should be the test for effective chlorination ; complete sterilization means the destruction also of all spore-forming organisms, so that results obtained on this criterion indicate an unnecessarily large dose of chlorine. Active chlorine may exist as hypochlorite, hypochlorous acid or free chlorine, as chloramines, or as substitution products of organic nitrogen compounds. For the experiments water from Batavia water-works was used ; it is almost free of

organic matter, and to remove traces of ammonia, as well as to saturate the water with respect to any capacity for absorbing chlorine, a slight excess of caporite was added and subsequently removed by exposure to sunlight. It is found that the pH value has great influence on the progress of sterilization by hypochlorite. At pH = 8, 18·7 per cent. of the active chlorine added as hypochlorite is present as HClO, at pH = 7, 70 per cent, and at pH = 6, practically all. Chlorine added as gas in normal doses for water treatment is also present as HClO. Hence it is only necessary to consider the action of the hypochlorous acid molecule and the hypochlorite ion and the ratio $HClO/OCl-$ is determined entirely by the pH value after establishment of equilibrium. At pH = 7 or less, the influence of changes of pH on the progress of sterilization were small; for values greater than 7 such changes have great effect and indicate that the hypochlorous acid molecule has considerably greater sterilizing power than the hypochlorite ion. For safety, therefore, it is advisable to tabulate from the results of the experiments the contact period necessary to secure effective treatment for pH = 8, by giving the same contact period for a lesser pH the margin of safety will be increased.

The statement sometimes made that chloramine is a more powerful disinfecting agent than chlorine is a misapprehension due to the fact that chloramine is less readily fixed by organic matter and therefore gets a longer period to exert its effect than does an equivalent quantity of chlorine as hypochlorite. The lesser disinfecting power of chloramine is indicated by the following table :—

Active chlorine	Disinfection period if present as—	
p.p.m.	Hypochlorite	Chloramine
0·05	30 minutes	> 10 hours
0·1	10 ,,	6 ,,
0·2	3 ,,	4 ,,
0·5	—	1·5 ,,
1	—	45 minutes
2	—	30 ,,

The error of the iodometric method of estimating chlorine is found to be ±0·05 p.p.m. of chlorine; the benzidin method is convenient in that the colour comes up rapidly and it is useful to enable one to decide rapidly if a proper dose of chlorine has been given; the rapid fading of the colour is a serious drawback and for quantitative work the orthotolidin estimation is preferable, but it should not be conducted in a very strong light. For separate estimation of hypochlorite chlorine in presence of chloramine a method has been worked out in which potassium ferrocyanide is the reagent; it is unaffected by chloramine. Unfortunately it is not very sensitive (± 0·1 p.p.m. chlorine). An alternative method of estimating hypochlorite chlorine is by means of 1 in 5,000 methyl orange. The methyl orange is run from a burette into 100 c.c. of the water to be tested until a drop gives a permanent red colour. The volume of methyl orange required is not proportional to the amount of hypochlorite and a

table is provided from which the chlorine concentration corresponding to a given titre of methyl orange can be read off. Results are accurate to $\pm 0{\cdot}03$ p.p.m. of chlorine.

GUY T. P. TATHAM.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

ALFTHAN, K. [Translated by JARVIS, A. C.] **A New Indicator for Chlorine.** *J. Amer. Water Works Assn.* 1928, v. 20, 407-11. [2 refs.]

The author makes use of dimethyl-p-phenylenediaminechlorinehydrate ($NH_2{\cdot}C_6H_4{\cdot}N{\cdot}(CH_3)_2\,HCl$) in a 0·1 per cent solution as a reagent for chlorine. Two samples of 100 c.c. each of the water to be tested are measured into Nessler cylinders and after acidifying with 2 c.c. of N/10 HCl, 1 c.c. of the reagent is added to one of the samples. After waiting 2 minutes for the development of the colour, the red due to presence of chlorine is matched by adding to the other cylinder a standard solution of methyl red. The volume of methyl red added gives the chlorine concentration. The advantage of the reagent over orthotolidin is claimed to be that the red colour is not interfered with by a yellow tint in the water; the disadvantages are that the pH of the solution for test has to lie between 2·6 and 3·4 and that the reagent is sensitive to iron in concentration greater than 0·1 p.p.m.

GUY T. P. TATHAM.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

HEDGEPETH, L. L., OLSEN, N. C. and OLSEN, W. C. **Chlorinated Copperas—a New Coagulant.** *J. Amer. Water Works Assn.* 1928, v. 20, 467-72.

The water supply for Elizabeth City, North Carolina, is derived from a sluggish stream draining a swamp; it is highly coloured with negatively charged colloidal particles. Coagulation with various precipitants, alum, sodium aluminate, copperas ($FeSO_4$), used separately and in conjunction, proved unsatisfactory from the point of view of colour removal, so also did an attempt at bleaching the colouring matter with chlorine. The problem has been solved by substituting ferric sulphate for copperas; the copperas is oxidized to the ferric condition by adding to it the requisite quantity of chlorine in aqueous solution. It is claimed that "copperas, completely oxidised with chlorine in the ratio of one part of chlorine to 7·8 parts copperas, produces a coagulant superior to alum in colour removal qualities and is more economical because of its higher efficiency."

GUY T. P. TATHAM.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

WOOD, C. B. **Succinchlorimide Proposed as a Chemical Agent for the Preparation of Potable Water.** *Milit. Surgeon.* 1928, v. 63, 493-506. [27 refs.] [Army Med. School, Washington, D.C.]

Difficulties of packing and transport and its rather low stability militate against the use of bleaching powder as a water sterilizer. Halazone reacts slowly with water and does not readily go into solution. It is suggested that succinchlorimide would prove more satisfactory. It is solid at ordinary temperatures, more stable than halazone, exerts a germicidal action in water and is apparently of low toxicity. It hydrolyses in water to form succinamic acid and hypochlorous acid.

GUY T. P. TATHAM.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

SHATTUCK, G. C. **Drinking Water for Travellers in the Tropics.** *J. Trop. Med. and Hyg.* 1928, v. 31, 229-32. [1 ref.] [Med. School, Harvard Univ., Boston, Mass.]

The Harvard African Expedition, consisting of a party of eight white men travelling in Liberia and the Belgian Congo, gained, incidentally, useful experience in the sterilizing of water for drinking purposes. Three methods of using calcium hypochlorite were tried and all proved unsatisfactory owing to the deterioration of the reagent, even when stored in glass ampoules. Halazone (4 per cent. p-sulphonedichloramidobenzoic acid, 4 per cent sodium carbonate, 92 per cent sodium chloride in 100-105 mgm. tablets, vide DAKIN and DUNHAM (*Brit. M. J.*, 1917 (1), 682) proved stable enough for practical purposes. Sufficient was added to impart a taste to the water, say 1 tablet to a quart of water, which would be equivalent to a dose of 1 p.p.m. active chlorine if the tablet be of full strength. For removing mud from water in the circumstances of such an expedition, Mr. M. C. WHIPPLE, of Harvard, suggests use of potash or ammonia alum, as a precipitant. Aluminium sulphate [the "alum" or "alumino-ferric" of the water works] would be unsuitable owing to its hygroscopic tendency. The Harvard Expedition spent a year in tropical Africa but no member of the party suffered from dysentery or severe diarrhœa.

GUY T. P. TATHAM.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 4.

Reviews.

ELEMENTS OF SURGICAL DIAGNOSIS. By Sir Alfred Pearce Gould. Revised by Eric Pearce Gould, M.D., M.Ch.Oxon., F.R.C.S.Eng. London : Cassell and Co., Ltd. 1928. Pp. xv + 730. Price 12s. 6d.

This excellent book has now reached a seventh edition. It is so well known that a detailed description is not required. The work has, however, undergone careful revision by Mr. Eric Pearce Gould, who has been associated with it since the fourth edition. Numerous alterations and additions have been made in this new edition, the more important of which are :—

The replacement of the first three chapters of the earlier editions by an Introduction, a change which has been made in order to provide the student with an easier and more interesting approach to the rest of the book.

Cholecystography and the use of lipiodol with X-rays have been introduced, and minor alterations and additions have been made in nearly every chapter.

There are now reproductions of twenty-six X-ray films.

The manual is well abreast of the knowledge upon which the diagnosis of surgical conditions is based. It is indispensable to the student, eminently serviceable to the qualified man, and should be in the library of every military hospital.

The book is well printed and of a handy size.

HANDBOOK OF ANÆSTHETICS. By J. Stuart Ross, M.B., Ch.B., F.R.C.S.E., and H. P. Fairlie, M.D. Third edition. Cr. 8vo. Edinburgh : E. and S. Livingstone. 1929. Pp. xvi + 339. Illustrations 66. Price 8s. 6d. net.

This third edition of Ross's well-known "Handbook on Anæsthetics" now coupled with the name of Dr. Fairlie is a welcome addition to the literature on anæsthesia, more especially as it is the only recent edition on this subject published for some years.

The book is of the same dimensions but is nearly double the thickness of the original edition published in 1919 ; it is printed on a better quality paper and with larger print, and has 339 pages instead of 214.

The whole text has been revised, the chapter on Gas and Oxygen considerably amplified and a short chapter on Ethylene and Oxygen included. The chapter on Shock is well written and brings out clearly the different theories on this subject. The book is readable, clear, concise and not too dogmatic. The authors describe mainly the methods obtaining in

Scotland, which differ in some respects from those south of the Tweed. For instance, under spinal anæsthesia the employment of tropacocaine is advocated and no mention is made of the use of stovaine, or that there are light and heavy solutions on the market, which necessarily require quite a different technique.

There is an error noted in the first edition that still remains in this one under review: on page 161 under intratracheal anæsthesia the distance from the incisor teeth in an adult to the bifurcation of the trachea is stated to be 26 cm. and it is recommended that the catheter should be placed just short of this. Actually the distance from incisor teeth to tracheal bifurcation is 31 cm. in an adult male and the site of election for the distal end of the catheter is 5 cm. above the bifurcation.

The chapter on Choice of Anæsthetic is practical and helpful, but under empyema on page 255 chloroform with added oxygen is advocated and no mention is made of the use of gas and oxygen, a most valuable method in serious cases; while on page 283 there is the somewhat contradictory statement that "this operation should always be performed under local anæsthesia."

Finally, under syncope during anæsthesia on page 217 (as also in first edition) it is stated "the only drugs likely to be of any avail are atropine and strychnine." Surely camphor in oil or preferably the aqueous solution of camphor (hexeton), now on the market, has a very definite place in this emergency. Also there is no mention of the successes recently achieved with the injection of adrenalin directly into the heart in case of syncope.

The above are but minor criticisms. The book can be thoroughly recommended to the student who wishes quickly to grasp the rudiments and theory of surgical anæsthesia. It is not intended as a work of reference for the specialist who must of necessity delve more deeply into the subject.

L. M. R.

HYGIENE AND PUBLIC HEALTH. By H. R. Kenwood and H. Kerr. London: H. K. Lewis and Co. Eighth edition. 1929. Pp. xi + 823. Price 31s.

The work under review is the well-known "Parkes and Kenwood." The arrangement and subject-matter remain unaltered except in minor details, and the present edition maintains the high standard of previous ones. A few additions and alterations, such as the use of chloramine for water purification, the British Admiralty test for disinfectants, and the substitution of zinc sulphate for chloramine T. as a nasopharyngeal disinfectant, have been made, and the section dealing with vitamins has been revised and brought up to date. The chapter on disinfection is clear and concise, though the use of hot-air, which proved of such great service as a means of mass disinfestation after the war, is dismissed with a mention in another chapter. The satisfactory disposal of manure from stables, and the increasing use of artificial silk as a material for the manufacture

of clothing, are other important subjects which might have received more attention. The book has lost nothing of its value as a textbook for candidates for diplomas in public health.

SURGERY IN THE TROPICS. By Sir Frank Powell Connor, D.S.O., F.R.C.S., Lieutenant-Colonel, Indian Medical Service. London: J. and A. Churchill. 1929. Pp. ix. + 293. Price, 12s. 6d.

The author of this small book states in the preface that tropical surgery includes every branch of ordinary surgery, but also demands a knowledge of some special aspects of surgery and various surgical diseases and complications, rare or unknown in a temperate climate.

He also states that this book makes no other attempt than to supplement the teaching which is laid down in an ordinary textbook on surgery and that it does not enter into competition with such excellent textbooks of tropical medicine as Manson's well-known work, etc.

The problem of what to omit in a book of only 249 pages has been dealt with fairly satisfactorily, and this will become easier with each further edition. At present, dysentery and filariasis take up 10 out of a total of 48 chapters. The surgical aspects of malaria and enteric fever are treated in a general way, no details being given of splenectomy and its results. More detailed descriptions would add value to the publication.

The book is a mass of surgical information of a general character and should be read by all surgeons proceeding to the tropics. It is very well printed and illustrated, and has a very interesting appendix on the tropical aspects of general surgery.

HÆMORRHOIDS. By Arthur S. Morley, F.R.C.S.Eng. Oxford University Press. H. Milford. 1929. Pp. ix + 122. Price 6s.

A further impression of this book has been brought out this year and is stated to be revised and enlarged. The book itself consists of 101 moderate sized pages (the print being large) and two appendices.

The contents consist of a somewhat brief description of the surgical anatomy, ætiology, symptoms, diagnosis and pathology of external and internal hæmorrhoids. Treatment then follows and consists of a very full description of the injection method with a 20 per cent solution of carbolic acid in glycerine and water. The author states he has been so universally successful with this solution that he has no practical experience of any other. On page 53 he takes exception to a 5-10 per cent solution of quinine and urea hydrochloride "as this solution has sometimes produced sloughing of the skin when used as a local anæsthetic." Yet on page 71 in describing complications met with by the use of his own solution he mentions "a little superficial sloughing of the mucous membrane, or even to sloughing of the whole pile."

The description of the operation is good and the results published are very good.

However, it is disconcerting to turn to Appendix I under the heading of "An Improved Technique" and find that owing to occasional occurrence of (1) severe pain, (2) secondary hæmorrhage, and (3) sloughing of the mucous membrane, the author has abandoned both the solution and the method of its introduction and now uses a 5 per cent solution of carbolic acid in a vegetable oil, preferably almond. As this change took place at the end of 1926 it would have been better to have described this method together with the former one in the body of the book and not as an appendix.

In its present state I consider the book unsatisfactory. It is well got up and clearly printed.

ON NEPHRITIS. By A. Cecil Alport, M.D. London: W. Heinemann, Ltd. 1929. Pp. xvi + 175. Price 7s. 6d. net.

In this compact little book, Dr. Cecil Alport succeeds in giving a clear summary of the present state of knowledge of kidney diseases.

Chapters I and II are devoted to an historical survey and an outline of of the types of nephritis. A classification correlating clinical with laboratory findings is given in which the term "nephritis" is confined to a degenerative group resembling nephritis clinically and comprising "toxæmic kidney" and "lipoid nephrosis." Chapters III to VI are concerned with a description of the various types of nephritis. The sections devoted to treatment embodying recent advances are particularly good. The value of Epstein's diet in subacute parenchymatous nephritis is discussed and the importance of giving large doses of urea up to 15 to 30 grms. thrice daily is stressed. Some original work on the excretion time of urea is described.

Chapter VII gives an excellent account of uræmia and its treatment.

In Chapter VIII there is a clear description of the ophthalmoscopic changes, and the prognostic omens of each condition are stressed. The last three chapters are devoted to the laboratory side of the question. A simple method of estimating the relative proportions of albumin and globulin is particulary recommended for the purpose of distinguishing between "orthostatic albuminuria," "leaky kidney" and nephritis.

The book is of handy size, easily readable and has a good index.

PUBLIC HEALTH LABORATORY PRACTICE. By A. D. Stewart and T. Crawford Boyd. London: Humphrey Milford, Oxford University Press. 1928. Pp. vi + 306. Price 12s. 6d.

In the preface to this book, the authors point out that in countries where public health work is being commenced it may be necessary for the medical officer of health to initiate a chemical laboratory and even to train

a staff. Hence they have written this book to enable medical men to do this, and at the same time they have had in view the student carrying out a course for the Diploma of Public Health.

The writers are authorities on the subject, one being professor of hygiene and the other a professor of chemistry in Calcutta, and the methods they have adopted in the various analyses are on the whole very sound and easy to follow.

The book gives details for general analytical procedure, the examination of water and sewage, milk, oils and fats, various foods, the detection of commonly occurring poisonous metals and of poisonous gases, the determination of the strength of disinfectant solutions, and the examination of rag flock. In addition there are the usual tables of atomic weights, measures, &c., and an index.

The printing is on good paper and in good legible type, with a few printers' errors, e.g., on page 80, O-toludine for O-tolidine ; page 95, L_D of lactose is given as + 58·5, and on page 231 it is + 52·5°. More attention should be paid in future editions to the headings : for example, on page 280 one suddenly jumps from the determination of poisonous metals to gaseous impurities in air on the same page, and in the analysis of wine on page 262 the headings are in the ordinary type instead of capitals, which make reading so very much easier.

It should be remembered that this is a first edition, hence there are many errors which will presumably be corrected in later editions. Here are a few of the most glaring examples :—

On page 6 it is stated that sodium bicarbonate must be *washed* free from chlorides and sulphates. Usually on washing sodium bicarbonate with water it dissolves fairly quickly.

On page 40 in the Tidy Forchammer process it is recommended that four bottles be used instead of the usual three ; the student will wonder what he has to put into the fourth bottle.

On pages 64 and 66 certain quantities of sewage and water are mixed for the dissolved oxygen absorbed test, and filled into bottles which should be completely full. The quantities given are not sufficient to fill the bottles and the student will be badly misled.

In addition to this some rather important things have been left out, for example, there is no bacteriological examination of water, although bacteriological results are given in typical analyses of different varieties of water. Also a method for the determination of iodine in water supplies might be useful. There is nothing about the determination of fat in cocoa, or added shell, and cocoa is missed from the index of the book. There is also no mention of the Rideal Walker or other methods for the determination of the strength of disinfectants.

It may be objected, however, that the bacteriology of hygiene should be done in the pathological laboratories, but it very seldom is so, and the book would not lose any value by the inclusion of the subject.

On the other hand the authors have included articles on "Chana," spelt Chhana in the index, on "Dal" and "Ghee" and other materials peculiar to India, articles which are very valuable coming from an authoritative source. This saves the book from the criticism that it is another added to the large number of books on this subject.

In the hands of the student, this edition of the book should be carefully checked against other works on account of errors ; in the hands of the expert, however, it is most useful, containing as it does a considerable amount of matter usually only found in laboratory notebooks.

And for the large amount of material given the price is very moderate, and not at all outrageous as is the case with some books on the subject.

S. E.

Notice.

"TABLOID" HYPODERMIC BULBOCAPNINE PHOSPHATE.

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Journal

of the

Royal Army Medical Corps.

Original Communications.

THE MALARIA TREATMENT CENTRE—KASAULI.

BY MAJOR S. SMITH,
Royal Army Medical Corps.

HISTORICAL.

THE Malaria Treatment Centre (M.T.C.) was initiated early in 1924 in the hope of finding a really satisfactory treatment for chronic relapsing malaria, admittedly the most crippling disease with which our Army in India has to cope. The first commanding officer was Major Sinton, V.C., O.B.E., I.M.S., who had already gained considerable experience as the head of a civil "Quinine and Malaria Enquiry," which had been investigating various malaria problems amongst the jail and civil populations of Northern India and of which the M.T.C. might be called a military offshoot.

In his selection of Kasauli as the site of the new venture, the D.M.S. (Major-General O. L. Robinson, C.B., C.M.G.) was doubtless influenced partly by the proximity of the other scientific medical institutions at Kasauli and partly by the fact that this Hill Station, being 6,100 feet above sea level, is above the malaria belt (at this particular latitude) and, for this reason, the possibility of fresh malarial infections modifying or distorting the results could be ruled out of court. In other words he could be sure that any individual attack of malaria at the M.T.C. was due to the inadequacy of the treatment previously employed, and not to any vagaries of the mosquito, producing a fresh infection, for which previous treatment could not be blamed.

In 1927, Major Sinton left the centre to take up the new appointment of Director of the Malaria Survey of India, also at Kasauli, and from his

headquarters, a fine and well-equipped building in the grounds of the Central Research Institute of India, he continues to keep a watchful eye on the M.T.C., acting in the advisory capacity of consulting malaria expert. We also receive very generous financial assistance from the "Indian Research Fund Association."

Our staff consists of the officer-in-charge and an assistant surgeon provided by the Army (the M.T.C. is under the direct ægis of A.H.Q., Simla), an experienced sub-assistant surgeon, a writer, laboratory attendant and a sweeper paid for from funds supplied by the Indian Research Fund Association. In addition, the Hill Depot, Kasauli, provides a serjeant clerk. Orderlies required for nursing duties and as clerks are provided from the establishment of the M.T.C.

The malaria convalescents live in barracks, where accommodation is available for 150, and come under the officer commanding the Hill Depot for discipline, pay, messing, etc.

A physical training staff is provided to help keep the men fit, and, during the winter months, all the station guards, necessary fatigues, etc., are performed by the convalescents.

In addition thirty beds are set aside at the British Military Hospital for those who suffer from a relapse of malaria whilst at the Depot.

Routine.

Every new arrival at the M.T.C. reports on the following morning to the B.M.H. for his initial medical examination, joining the 9.30 a.m. malaria parade for this purpose. On this, his first inspection, the fresh arrival receives a thorough general physical examination; a blood-smear (thick film) is examined, his blood-pressure, hæmoglobin percentage, weight, and spleen are measured, and the results of these several examinations, together with his malaria history, record of service, etc., are entered on his chart, which is then filed and produced at his subsequent weekly inspections both for reference and for further entries to be made thereon.

Men whose hæmoglobin has been found to be under seventy per cent (the proportion of these is small), have, during the past season, been ordered "liver diet" (i.e., eight ounces of cooked sheep's or bullock's liver in addition to the ordinary diet).

Those with a hæmoglobin percentage between 70 to 75, have been treated with iron and arsenic tonic for a month or until their hæmoglobin percentage has risen above 85.

During his first week at the M.T.C. the convalescent is excused all duties; afterwards, if fit, he is marked "general duty," and becomes available for guards, fatigues, etc., and joins a physical training class.

After their primary medical examination all convalescents report weekly for: (1) determination of weight; (2) examination of blood-smear (thick film); and (3) examination of spleen and liver. The results in each case being entered on their charts and checked against previous entries. In

the case of those undergoing "liver" or tonic treatment, weekly hæmoglobin estimations are made, Hellige's apparatus being used.

A small proportion of cases of parasitic relapse unaccompanied by fever or symptoms is met with at the weekly inspections. These men, who may feel perfectly fit, are treated in exactly the same way as clinical relapses; they are admitted to hospital and receive the full course of routine treatment.

Each case of fever is detained in hospital, three blood-slides (thick film) are taken daily and examined, and only in the event of a positive blood-slide is the patient admitted to the malaria wards, where, after a preliminary

Palpating the spleen. The wooden leg-rest prevents soiling of the mattress by dirty boots, and ensures relaxation of the abdominal muscles.

hæmoglobin estimation, he at once comes under one or other of the routine treatments.

Our treatments were, with the two exceptions noted below, carried out on a rigidly alternating system of: (1) treatment under trial, (2) control treatment (quinine), the patients for each treatment being taken in rotation, and given serial numbers, without any special selection. The exceptions were:—

(1) Patients who had already relapsed on one form of treatment at the M.T.C., received some other drug, usually plasmochin, in the treatment of a subsequent relapse.

(2) The last plasmochin series was not, in most cases, controlled by an alternating "quinine group," our wish being to test the severity and extent of any toxic symptoms that might arise during treatment with plasmochin

in modified dosage (0·04 gramme daily) in as large a number of cases as possible before the end of the season.

The temperatures of all patients are recorded on four-hourly charts for the four or five days they are in hospital, blood-slides are examined three times daily until a definite diagnosis is arrived at, and the spleen is palpated daily, the results of the examination of the spleen and of the blood-slides being entered on the charts. When the slides have been negative for two or three days and there is apparent clinical recovery, the patient is marked out to attend and excused duty until his course of treatment is completed. During the whole course of treatment, both in and out of hospital, the patient receives his medicine once, twice, or three times a day, as the case may be, under the direct supervision of the assistant-surgeon, sub-assistant-surgeon, or officer in charge; this expert supervision is specially valuable in the cases under treatment with plasmochin when toxic symptoms may be recognized early and promptly dealt with.

On the completion of treatment a second hæmoglobin estimation is made.

If possible, every convalescent remains at the M.T.C. for a full observation period of two months, or for two months following cessation of treatment if he relapses while under observation. In no case are we allowed to keep a convalescent for more than six months, at the end of which time he must be either returned to his unit or recommended for an invaliding board.

During this observation period, as noted above, he reports to the British Military Hospital weekly for medical examination and for the various tests to be carried out, the results of these being entered on his chart, which thus acts as a very complete medical "dossier" during the man's stay at the centre.

The summer months are exceedingly busy at Kasauli, as at other hill stations; there is frequently a shortage of officers to carry on the routine work of the station, and as my functions included those of staff-surgeon and ordinary routine hospital duties, the amount of time that could be devoted daily to the malaria convalescents was somewhat limited.

However, we managed to carry out a certain number of investigations, and those concerning the "trying-out" of the various forms of treatment have been fairly complete.

I have made a point of taking *personal daily notes* on all cases of malaria under the various forms of treatment, paying special attention to the presence and duration of splenic enlargement, presence or absence of herpes labialis, duration of pyrexia, persistence of parasites in the peripheral blood, toxic symptoms (common in treatments with plasmochin), etc., as well as the ultimate effects of the various lines of treatment on the subsequent relapse rate. Our results have been submitted in the form of monthly clinical reports to A.H.Q., and it is from these I have largely drawn for this paper.

CHART.

Coy.	No.	Name	Rank	Unit	Service in India	Height	Attacks since May 1, 192 .	Nature of parasite	Date of inspection by A.D.M.S. and remarks	Date of striking off of sick list
A	123 –	R ——	L/C.	Worcester Regt.	4					

Date	Weight (st. lb.)	Conditions: General	Conditions: Spleen	Conditions: Liver	Treatment: Received on last attack	Treatment: Medicinal received	Treatment: Dietetic	Duties fit for	Result of blood-smear	Medical Officers' remarks and signature
29.8.28	9 4	Fair	N.	N.	—	—	Liver	E. D.	Neg.	H.B.O. = 56·2 %. B.P. = 138/75
5.9.28	9 0	,,	P.	,,	—	Q.C.M.	,,	Hospital	B.T. ¼, full $\frac{10}{20}$	
12.9.28	9 5	,,	N.	,,	—	,,	,,	E. D.	Neg.	H.B.O. = 66 %
19.9.28	9 8	,,	N.	,,	—	,,	,,	E. D.	Neg.	,, = 72·9 %
26 9.28	10 0	,,	N.	,,	—	,,	,,	E. D.	Neg.	,, = 89·5 %
3.10.28	10 4	,,	N.	,,	—	1	—	G. D.	Neg.	
10.10.28	10 5	,,	N.	,,	—	2	—	G. D.	Neg.	
17.10.28	10 7	,,	N.	,,	—	3	—	,,	,,	
24.10.28	10 2	,,	P.	,,	Q.C.M.	P.M.Q.	—	Hospital	B.T. ¼, gametes $\frac{60}{20}$	H.B.O. = 74·3 %
31.10.28	10 5	,,	N.	,,	—	,,	—	E. D.	Neg.	
7.11.28	10 8	,,	N.	,,	—	,,	—	E. D.	Neg.	
14.11.28	10 9	,,	N.	,,	—	,,	—	E. D.	Neg.	H.B.O. = 85·4 %
21.11.28	10 12	,,	N.	,,	—	1	—	G. D.	,,	
28.11.28	10 13	,,	,,	,,	—	2	—	,,	,,	

SPECIMEN CHART.

Pte. R. of the Worcesters arrived in Kasauli 29.8.28. Hæmoglobin percentage on arrival 56·2. He was put on to liver diet. He relapsed with malaria B.T. (10 parasites found in 20 fields of a thick film) on 5.9.28 and was admitted to hospital receiving a 21 days' course of quinine, citric acid and mag sulph. mist. (Q.C.M.). For three weeks after completion of treatment there was no relapse and he was performing full duties (G.D.). On 24.10.28 he again relapsed and received a 21 days' course of plasmochin and quinine (P.M.Q.). His H.B.O. on commencement and completion of treatment with P.M.Q. was 74·3 % and 85·4 % respectively. By the 28.11.28 he was 2 weeks clear following cessation of treatment. After a further 6 weeks' freedom from relapse (noted on another sheet of chart) he had completed his 8 weeks' observation without relapse and was returned to his unit.

In addition to our main terms of reference, i.e., the effects of various drugs given during varying periods on the malaria relapse rate, we have carried out a few subsidiary investigations dealing with : (1) hæmoglobin percentage ; (2) blood-pressure ; (3) weight. These will now be shortly discussed.

HÆMOGLOBIN PERCENTAGE.

The Hellige hæmoglobinometer has been used throughout by the same individual (Sub-Assistant-Surgeon Diwan Chand). The initial readings may not have been accurate, but at least all readings have been consistent.

The instrument is an easy and satisfactory one to use, the standard tint corresponding very closely with the colour of the blood examined (when diluted with $\frac{N}{10}$ HCl) ; the error due to personal equation appears slight. I have frequently tested Diwan Chand's estimations and usually we are in agreement. This cannot, I think, be said for most other types of "tintometer" used for hæmoglobin estimations where the personal factor looms unduly large. The drawback of this instrument is that a goodly prick has to be made, 20 c.mm. of blood being required for the test.

Hæmoglobin estimations are made (1) on all *arrivals* at and *departures* from the M.T.C. ; (2) weekly on all cases whose hæmoglobin on arrival is under 75 per cent and who come automatically on either liver diet (under 70 per cent), or tonic treatment (70-75 per cent) ; (3) at the commencement and on completion of treatment in all cases of malaria relapse.

With very few exceptions all cases have added considerably to their hæmoglobin percentage by the time of their departure from the station. The greatest gain has been recorded in most cases during the first ten to fourteen days of their stay, and is in all probability part of the physiological polycythæmia that takes place in most normal individuals after a few days' residence at any considerable height above sea-level.

Table I shows the average hæmoglobin percentage on arrival and departure with the average gain of a series of cases.

TABLE I.

Numbers investigated	Average hæmoglobin per cent. (arrival)	Average hæmoglobin per cent. (departure)	Month of departure	Average stay in Kasauli	Average gain
33	73·7	88·5	June, July	16·6 weeks	14·8 per cent.
28	79·3	87·2	August	9·5 ,,	7·9 ,,
29	76·4	88·4	September	10 ,,	12 ,,
36	80·0	92·8	October	10·4 ,,	12·8 ,,
41	78·6	87·7	November	13 ,,	9·1 ,,
11	79·5	86·6	December	16 ,,	7·1 ,,

Of 207 arrivals at the M.T.C. between the months March-November, 1928—

3	had	an initial	hæmoglobin	under	60 per cent
23	,,	,,	,,	between	60 and 70 per cent
89	,,	,,	,,	,,	71 and 80 per cent
84	,,	,,	,,	,,	81 and 90 per cent
8	,,	,,	,,	over	90 per cent

One of the three with an initial hæmoglobin percentage of 42·3, the lowest recorded during the season, was subsequently found to be suffering from a severe inter-current disease; another with an initial percentage of 54·8 was a severe case of chronic relapsing M.T. malaria from Bombay.

Of a series of 137 departures during the same period, only 11 (8 per cent) had an average hæmoglobin percentage on departure of less than 80, 11 (8 per cent) had become more anæmic and 9 (6·6 per cent) had failed to gain since arrival.

During the course of this investigation we have received striking proof of the fact that the pallor of a man's face is *no* guide to the extent of his anæmia. The most pallid individual met with, clinically a typical case of severe malarial anæmia, had a hæmoglobin percentage of 86·8, well above the average.

Anæmia (as judged by hæmoglobin estimation) to any serious extent would appear to be uncommon in chronic relapsing malaria, unless possibly at the commencement or during the course of an actual attack of malaria (especially M.T.) before effective treatment is instituted (*vide* tables IV and V).

Malarial cachexia, even after repeated relapses of malaria, is, as far as our experience goes, somewhat of a rarity in the case of the British soldier, and should not be diagnosed until all other causes of cachexia have been definitely negatived.

A white face and a history of chronic relapsing malaria do not constitute malarial cachexia.

A small series of cases was investigated to determine the effect, if any, of prolonged residence in India on the hæmoglobin percentage. Our results appeared to indicate that residence up to six years had little ill-effect, but beyond this period there was a distinct tendency to a lowered hæmoglobin percentage.

That the number of previous relapses of malaria has little influence on the hæmoglobin percentage is suggested by the following figures[1] :—

Number of cases	Previous relapses	Average hæmoglobin percentage
17	1	79
20	2	78
24	3	77
10	4	81
21	more than 4 (average 6·9)	79·5

[1] This observation is made in regard to the well-fed British soldier who receives adequate and early treatment for each relapse.

There are two fallacies in this series.

(1) The data were taken entirely from the men's medical history sheets, many mild relapses being missed. In some cases medical history sheets were lost.

(2) In many cases the relapses were spread out over a number of years. It is probable that relatively few relapses spread out over a shorter period would produce a greater degree of anæmia than a greater number of relapses occurring over a longer period.

Blood-Pressure (B.P).

The blood-pressure (systolic and diastolic) of all malaria convalescents is taken on *arrival* and shortly before *departure.*

The "Esska" sphygmomanometer, a German modification of the "Tycos" type, has been used throughout, and the auscultatory method (checked by palpating the radial pulse) has been made use of.

The average blood-pressure has remained remarkably constant from month to month and between arrival and departure, but there have been considerable fluctuations in the blood-pressure of individual cases from time to time (*vide* Table IIA).

Below are tabulated the average blood-pressures of groups of men taken on arrival at, and departure from, the station.

TABLE II.

Numbers examined	Average blood-pressure on arrival	Average blood-pressure on departure	Month of departure	Average stay
14	128·8	130·8	August	8·2 weeks
24	129·9	131·8	September	8·7 ,,
32	129·5	128·8	October	9·3 ,,
40	131·8	128·3	November	12·3 ,,
11	131·8	139	December	16 ,,

The systolic blood-pressure was taken of 167 men on arrival at the station; of these—

0— 0·0	per cent had blood-pressure under 100 mm. of Hg.	
3— 1·8	,, ,, ,, between 100-110 mm. of Hg	(both figures inclusive)
40—24·0	,, ,, ,, ,, 111-120 ,, ,,	(,,
53—31·1	,, ,, ,, ,, 121-130 ,, ,,	(,,
46—27·5	,, ,, ,, ,, 131-140 ,, ,,	(,,
22—13·2	,, ,, ,, ,, 141-150 ,, ,,	(,,
2— 1 2	,, ,, ,, ,, 151-155 ,, ,,	(both 155)
1— 0·7	,, ,, ,, over 155 ,, ,,	(160)

On the whole it was found that a slightly higher reading of the systolic blood-pressure was obtained by auscultation at the elbow than by palpation at the wrist.

In a small proportion of cases the pulse could not be auscultated at the bend of the elbow (probably owing to some anatomical peculiarity) although there might be a good radial pulse.

In some few others the diastolic pressure could not be gauged with any accuracy; but these cases formed a very small proportion of the whole and in the great majority the auscultatory method proved quite satisfactory.

The blood-pressure was invariably taken on the right arm, the patient lying at full length on a comfortable mattress with his arm fully extended during the reading of the manometer.

That there may be marked variations in the blood-pressure (both systolic and diastolic) of individuals, when a series of estimations at varying intervals is made, is shown by the accompanying table (Table IIA).

Of the two, the diastolic pressure (the difference between the systolic and pulse pressures in the subjoined table) tends to show less variation than the systolic.

TABLE IIA.

Blood-pressure Case No.	Initial blood-pressure (in mm. of Hg)	Blood-pressure after 1 week	Blood-pressure after 1 month	Final blood-pressure on departure	Greatest variation in blood-pressure	Greatest variation in pulse pressure
Case 1 ..	140 (40)	150 (70)	120 (35)	140 (50)	30	(35)
,, 2 ..	110 (40)	125 (65)	130 (60)	140 (45)	30	(25)
,, 3 ..	160 (50)	135 (60)	145 (45)	150 (60)	25	(15)
,, 4 ..	138 (63)	150 (60)	140 (?)	120 (40)	30	(23)
,, 5 ..	160 (80)	140 (75)	125 (55)	125 (50)	35	(30)
,, 6 ..	120 (45)	120 (50)	150 (70)	130 (50)	30	(25)
,, 7 ..	135 (55)	120 (40)	125 (45)	155 (80)	35	(40)
,, 8 ..	145 (50)	150 (60)	120 (30)	140 (50)	30	(30)
,, 9 ..	130 (65)	125 (45)	120 (55)	150 (45)	30	(20)
,, 10 ..	140 (50)	158 (58)	135 (55)	125 (30)	33	(28)
,, 11 ..	140 (60)	130 (50)	105 (?)	138 (50)	35	(10)
,, 12 ..	120 (35)	150 (?)	145 (45)	145 (?)	30	(10)
,, 13 ..	160 (80)	140 (75)	125 (55)	125 (50)	35	(30)
,, 14 ..	120 (40)	125 (50)	150 (65)	130 (55)	30	(25)
,, 15 ..	120 (40)	110 (55)	130 (50)	150 (60)	40	(20)
,, 16 ..	140 (60)	130 (50)	105 (?)	138 (50)	35	(10)
,, 17 ..	140 (60)	150 (70)	120 (35)	140 (50)	30	(35)
,, 18 ..	120 (60)	80 (?)[1]	110 (40)	—	40	(20)
,, 19 ..	110 (45)	120 (55)	—	150 (50)	40	(10)
,, 20 ..	120 (40)	—	140 (40)	150 (55)	30	(15)

[1] The patient was in hospital with a severe attack of urticaria when the above low systolic reading "80" was obtained.

Figures in brackets are the pulse pressure, i.e., difference between systolic and diastolic readings.

In certain cases marked (?) the diastolic pressure could not be ascertained with any accuracy.

The above small group does not represent a continuous series, but was abstracted from a larger similar series of seventy-five cases and shows the greatest variations in the larger group. The average greatest variation in blood-pressure for the whole group was 17·3 mm. of Hg.

Weight.

Most malaria convalescents have shown a satisfactory gain in weight during their stay at Kasauli. The average gain or loss of weight with the average duration of stay is tabulated below :—

Numbers examined	Month of departure	Average gain or loss of weight	Average duration of stay
33	June and July	−1·9 lb.[1]	16·6 weeks
23	August	+4·5 lb.	9·5 ,,
30	September	+4·4 lb. (only 4 lost weight)	10 ,,
38	October	+3·6 lb. (4 lost weight) (4 failed to gain)	10·4 ,,
42	November	+4·2 lb. (3 lost weight) (3 failed to gain)	13 ,,
11	December	+6·6 lb. (none failed to gain)	16 ,,

[1] The loss in weight recorded for those who joined their units during June and July is explained partly by the fact that a proportion of these men had wintered in Kasauli and were merely throwing off their winter fat and clothing; June and July also were hot and oppressive and khud climbing during these months is not conducive to gain in weight.

Clinical.

Two hundred and forty malaria convalescents have joined the malaria treatment centre since the beginning of the year. Of this number 77 have relapsed with benign tertian and 5 with malignant tertian malaria (total relapse rate 37 per cent) while at the centre, and have been admitted to hospital. In addition, 2 had a combined malignant tertian and benign tertian infection. No cases of quartan malaria have occurred.

Of a series of 78 cases of malaria benign tertian relapse admitted to hospitals, 54 (69·4 per cent) only had one relapse, 20 (25·6 per cent) had a second relapse and 4 (5·1 per cent) had three relapses while at the centre.

Of the 5 cases of malignant tertian relapse, 3 had one relapse and 2 each had four relapses. Both of these latter had become primarily infected in the South (1 Kirkee, 1 Bombay) where a type of malignant tertian malaria more virulent and less amenable to treatment than the Punjab variety is said by some to occur.

Enlarged Spleen.

Of a series of 104 malaria convalescents joining the centre only four (3·8 per cent) were noted to have clinically enlarged spleens on arrival. Of this number two had benign tertian parasites in their peripheral blood and suffered a clinical relapse on the evening of their arrival in Kasauli.

These figures suggest that clinical enlargement of the spleen is not commonly met with in cases of chronic relapsing malaria *between* the relapses, if they are treated early and efficiently in each attack (*vide* footnote p. 87).

It is important to remember that malaria is not the only cause of enlarged spleen even in those with a long malarial history.

Leukæmia, splenic anæmia, kala-azar, and tuberculosis are among a

long list of other possible causes of an enlarged and tender spleen in an apyrexial patient.

Pyrexia and rigor apart, the two most important and constant physical signs met with during a clinical relapse were enlarged spleen and herpes labialis. The diagnostic value of the latter, when present, as an early sign in malaria is not, I think, fully appreciated. In many febrile conditions—among others, fevers of the enteric group—herpes labialis is uncommon and its occurrence in a doubtful case is decidedly against the latter diagnosis and in favour of malaria.

Enlarged and tender liver was but seldom met with (one only in this series), probably on account of the small number of cases of malignant tertian treated.

Of a series of 119 relapses of malaria admitted to hospital during June to November, 1928, fifty-seven (48 per cent) were noted to have enlarged spleens at some period during the attack, usually on the second or third day.

In the same series thirty-one (26 per cent) were noted to have herpes labialis. The monthly distribution of those with enlarged spleens was as follows:—

10	occurred in	24	cases of active malaria,	i.e.,	41·7	per cent	during	*June*
8	,, ,,	20	,, ,,	,,	40·0	,,	,,	*July*
18	,, ,,	25	,, ,,	,,	72 0	,,	,,	*August*
11	,, ,,	24	,, ,,	,,	45 8	,,	,,	*September*
7	,, ,,	15	,, ,,	,,	46·6	,,	,,	*October*
3	,, ,,	11	,, ,,	,,	27·3	,,	,,	*November*
2	,, ,,	4	,, ,,	,,	50·0	,,	,,	*December*

Of the twenty-seven cases with herpes labialis,

5	occurred in	24	cases of active malaria,	i.e.,	20·8	per cent	during	*June*
6	,, ,,	20	,, ,,	,,	30 0	,,	,,	*July*
8	,, ,,	25	,, ,,	,,	28·0	,,	,,	*August*
2	,, ,,	24	,, ,,	,,	8·3	,,	,,	*September*
6	,, ,,	15	,, ,,	,,	40·0	,,	,,	*October*
4	,, ,,	11	,, ,,	,,	36·3	,,	,,	*November*
2	,, ,,	4	,, ,,	,,	50·0	,,	,,	*December*

It will be noted that the monthly distribution of herpes labialis in this small series of cases was much more "patchy" than that of enlarged spleen. There appeared to be no more than a casual tendency for enlarged spleen and herpes labialis to occur together in the same patient; nor did the splenic rate appear to be influenced, except possibly to some extent in an inverse ratio, by the number of previous relapses.

Thus of a series of 55 cases who were admitted to hospital with active malaria, 27, with an average relapse rate (before joining M.T.C.) of 2·4 attacks, were noted to have enlarged spleens, 28 cases, with an average relapse rate of 3·3 previous attacks, had no splenic enlargement. Of 10 cases with a history of more than 4 previous attacks only 20 per cent had splenic enlargement during a subsequent attack at the M.T.C.

The above results suggest that the incidence of splenic enlargement during an attack of malaria is not to any extent influenced by the number of previous relapses. In fact, for the small series examined those with a high relapse rate (more than four relapses) had the least tendency to splenic enlargement during a subsequent relapse.

That the mere finding of malarial parasites in the blood of a pyrexial patient does not rule out the co-existence of some other disease is well shown by the following case:—

Case 1.—Gunner T. was admitted to the B.M.H., Subathu, on May 14, 1928, with a two days' history of nausea, vomiting, and headache, and a

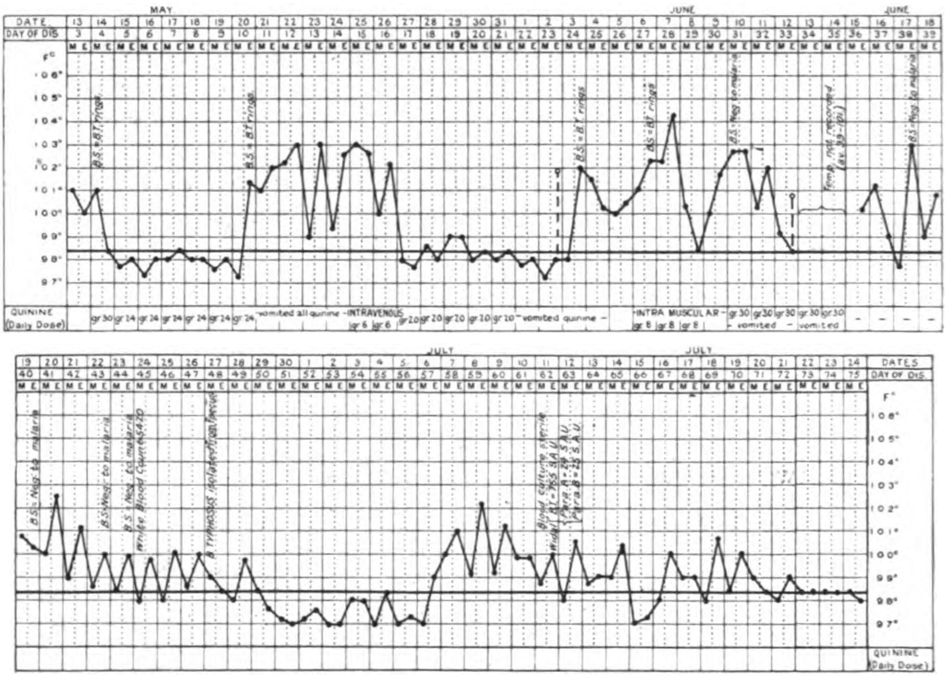


CHART I (*Case* 1).

temperature of 100° F. Benign tertian rings were found in a blood-film and his spleen was palpable. The temperature dropped after the administration of quinine and remained normal for five days. On the sixth day there was a sudden rise of temperature to 101·4° F., he had a rigor, his spleen, which had receded during the apyrexial period, again became enlarged and tender, and benign tertian rings were found in a blood-slide. He continued to run an irregular temperature in spite of quinine. After a week's pyrexia his temperature again fell abruptly to normal and remained so for a week, at the end of which there was a third abrupt rise to 102° F.: benign tertian rings were again present in a blood-film. In spite of the

continued administration of quinine by the mouth, much of which he vomited, and by intramuscular injection, he continued to run an irregular pyrexia and was transferred to the B.M.H., Kasauli, on June 15, as a case of resistant malaria. He ran an irregular pyrexia for a further fifteen days, during which time frequent blood-slides were negative. *Bacillus typhosus* was isolated from his stools on June 27, the twenty-third day of his third pyrexial attack. After a further apyrexial period he suffered a further mild relapse lasting eight days.

It is interesting to conjecture in this case to which bout of fever should be ascribed the primary attack of typhoid. It was considered that the first two febrile attacks were in all probability uncomplicated malaria, somewhat resistant to quinine on account of the continuous vomiting. During the third more prolonged pyrexial attack typhoid fever was grafted on to an attack of malaria; the fourth pyrexial attack was a mild typhoid relapse.

(*To be continued.*)

RANDOM JOTTINGS ON THE TRAINING OF THE R.A.M.C.

By Lieutenant-Colonel G. A. K. H. Reed,
Royal Army Medical Corps.

Part III.—The Advanced Training of Stretcher-Bearers for Mobile Warfare.

I.—General Considerations.

Much has been written and spoken about the important matters of medical administration in war and of the tactical handling and organization of the various field medical units with a view to expediting the collection, evacuation and distribution of casualties; but of the men who first find the casualty and who are, as it were, the spear head of the elaborate organization little is heard, yet upon them to a very great extent depends the success or failure of the whole scheme.

The work of clearing casualties from the line is in many ways the most difficult of all, and it is submitted that sufficient attention has not been paid to this echelon of medical aid—in fact, training in this respect has retrogressed of late years owing, I suggest, to excessive adherence to the lessons learnt in the semi-sedentary type of warfare with its restricted frontages and limited objectives which obtained most of the time on the Western front in the late war, and also to the inadequate numbers of stretcher-bearers, both regimental and R.A.M.C., which are shown in War Establishments.

Formerly some attempt was made to train stretcher-bearers to search ground in extended formations, but this has of late years been abandoned, and the R.A.M.C. stretcher-bearers are looked upon as "men of burden," whose sole duty is to evacuate casualties from a definite and fixed regimental aid post to some point where they may be conveyed on wheels to the advanced dressing station of a field ambulance. In mobile warfare it frequently happened that there were no definite R.A.P.'s, and with the very wide frontages adopted nowadays it will frequently happen again. The place of the R.A.P.'s may be taken by numerous groups of wounded whom the R.S.B.'s have not been able to get to a central position, and in addition there will be scattered wounded whom the R.S.B.'s have missed altogether. With an infantry brigade occupying a frontage of between three and four miles the scope of the R.S.B.'s will be very limited unless their number is much increased; wounded will, therefore, have to be searched for either by the R.S.B.'s or the field ambulance S.B.'s, and for this purpose an extended formation is necessary. Some method of controlling this formation is essential, otherwise squads or individual bearers will lose their direction and themselves.

Beaters employed to round up game are carefully trained in moving in extended order, in keeping direction and in inter-communication by signals, orders, etc.

The infantryman is not considered "trained" until he can move over broken and difficult country in extended formation and under control, but the training of the stretcher-bearer who will also have to do these things in mobile warfare begins and ends on the barrack square!

The principles of this training which I have ventured to put down in some detail can be quickly learnt and form an agreeable variation to the formal stretcher drill, and on this groundwork a more complete edifice can be built at the annual field ambulance training camps. Such methods should also be taught to regimental stretcher-bearers. It may be argued, incorrectly I submit, that:—

(1) "The regimental stretcher-bearer is a trained soldier and knows all about extended formations, inter-communication, signals, etc.," *but* as soon as a squad become possessed of a stretcher they promptly put aside their training and hang together round the stretcher because they have been taught to do so.

(2) "The duty of field ambulance stretcher-bearers is to clear the R.A.P.'s and to do this no training in extended formation, etc., is necessary, and their numbers also preclude their attempting to do more than this." Though this may be true, searching, as I will endeavour to show, is necessary; therefore, train the bearer suitably and increase his numbers.

(3) "The organization of field ambulances, in common with that of the whole army, is in the melting pot, and mechanization may soon, by means of armoured "cross-country" ambulance wagons, eliminate the stretcher bearer almost entirely or at any rate make him a man whose sole job is to load a casualty into an ambulance wagon." It may almost come to this, but even the most efficient ambulance wagon cannot search thickets, spinneys of closely grown trees or similar features, and the method of training suggested is just as applicable to one squad as to many, and just as suitable for regimental stretcher-bearers (who generally work in single squads) as for field ambulance bearers who normally work in detachments of several squads.

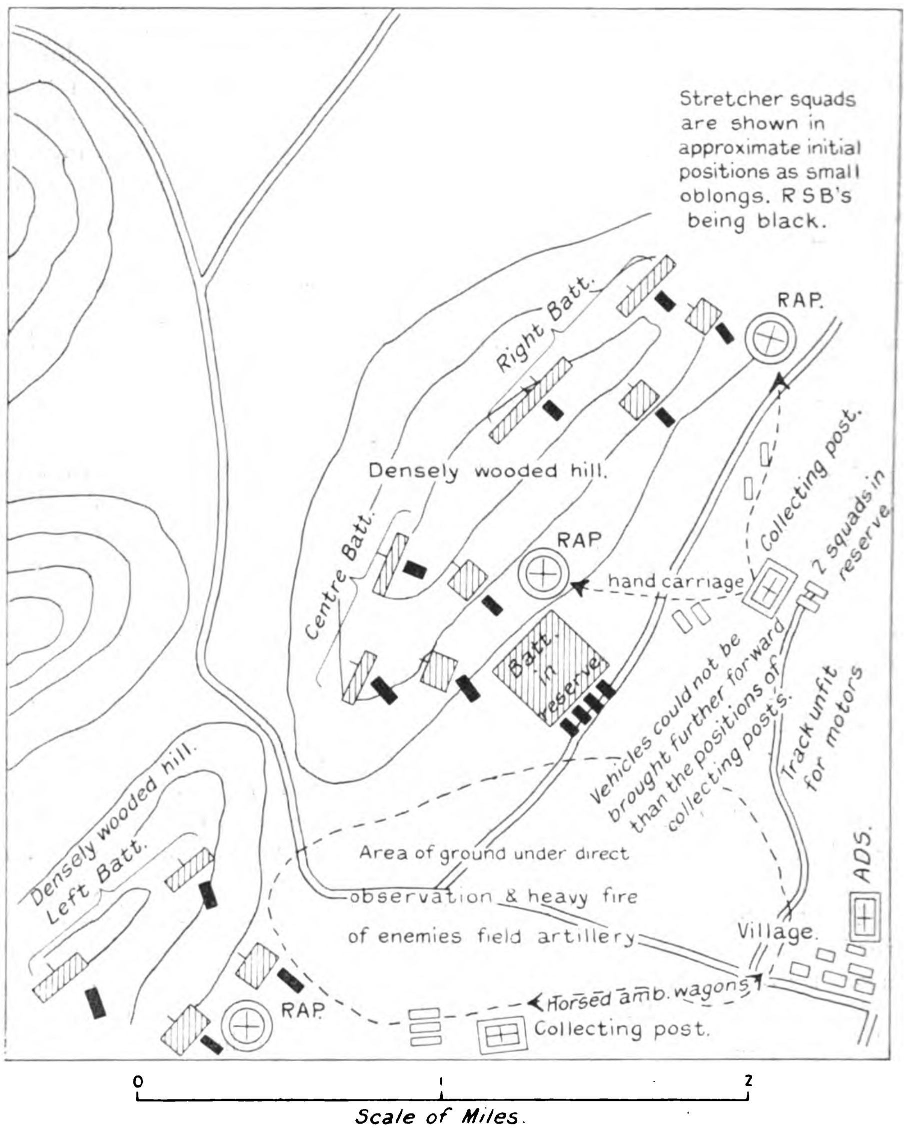
The scheme described later has borne the acid test of mobile warfare over large frontages, and was used by many field ambulances and regiments on several fronts and was even found useful at the Battle of Loos.

War is undoubtedly the best training, but in this connexion one cannot help but think that many of us cannot get away from the highly specialized, narrow-fronted, semi-sedentary warfare of the "Western Front," with its limited objectives.

The authorities tell us that the warfare of the future is to be highly mobile and over large frontages, and I would here draw attention to the rough sketch, fig. 1; this shows the actual deployment of an infantry brigade, forming part of a division during some recent tactical exercises.

The frontage occupied by the whole division excluding the divisional cavalry was 7½ miles, and the frontage of the brigade in question was 3½ miles with three battalions in line and one in reserve. The country was very hilly, very close and covered with woods of varying density. The deploy-

FIG. 1.



ment was at the commencement of an attack, and during the succeeding three hours the brigade had advanced some two to three miles further forward. The frontage is not exceptional, in fact several battalion commanders have told me that they expect to have to look after a front of

2,000 yards under certain conditions. As the essential principle in handling field ambulances in mobile warfare is to keep as large a reserve as possible to meet developments the officer commanding field ambulance in this situation could only spare one company to collect the casualties of the brigade in this initial phase. A company has only nine stretcher squads; each battalion has only four squads (of four men). It will be noticed that the R.A.P.'s were over one mile apart—i.e., corresponding to the frontages occupied by battalions, and that the two field ambulance collecting posts (car posts) were nearly two miles apart as the main road was under view and fire from the enemy. This also explained the reason why the A.D.S was situated so far back. It was impossible to get transport along the road, collecting posts were therefore formed to each flank under shelter. The increased range (9,000 to 10,000 yards) of light Field Artillery will make this situation very frequent.

The sketch is roughly to scale and the distances which would have to be traversed by the bearers are obvious; also, if it is remembered that the country was very broken, the liability of wounded to be missed by the R.S.B.'s. is apparent.

The line advanced at the average rate of half mile per hour.

Over this densely wooded area a single regimental stretcher squad would be responsible for searching over a quarter mile of front.

It was necessary to keep two field ambulance squads in reserve to "take care of" the reserve battalions, therefore the remaining seven squads had to evacuate casualties from three R.A.P.'s, each situated over a mile apart, an average of two and one-third squads to each R.A.P., the area to be covered being some four square miles. The collecting posts (car posts) were as far forward as possible, but owing to the large frontage were on an average over one mile distant from some R.A.P.'s.

The wheeled stretchers would have helped only a little. They average hardly more than one wheeled stretcher to each R.A.P., i.e., six per field ambulance. Can one put the necessity for more bearers, both regimental and field ambulance, more strongly?

It must be emphasized that the line was advancing at the average rate of half mile per hour, and that R.S.B.'s must keep in touch with their companies in mobile warfare, otherwise they cannot do first aid to the maximum number of cases.

It should also be understood that the writer has not in view an extended wave of field ambulance stretcher-bearers dogging the footsteps of the infantry, for a wounded stretcher-bearer is worse than useless, he makes work for others. Collection of casualties on any scale must take place during lulls in the fighting, but lulls are only comparative in modern warfare; attack and counter-attack follow closely.

A few field ambulance squads or even single squads can, however, do good work during the actual fighting by searching patches of broken ground

and working up to the R.A.P.'s, but they must be properly trained if they are to do this successfully.

The necessity for re-organizing field ambulances is recognized, but in the new war establishments it is noticeable that the number of stretcher-bearers has *not* been increased. This I submit is a crying need.

In mobile warfare a field ambulance reverts to its normal rôle as a collecting and clearing unit. It is not the place for elaborate medical or surgical work. It is thought, therefore, that the large headquarters might be reduced somewhat.

This headquarters, moving as it does partly on foot and partly in automobiles and partly on horses, is a difficult unit. It is suggested that it be completely mechanized, including means of transporting the personnel. It would also facilitate matters very much if one of the vehicles was fitted up as a mobile dressing-theatre, so that the necessity of packing and unpacking each time a move has to be made would be reduced.

Let us hope that the day is not so very far distant when a "permanent field ambulance" will become a fact, when these and other probably more important problems can be worked out in practice.

In peace time re-organization is difficult, especially when all the units in question are non-existent; too much has to be left to the imagination, and experience has often to be based on situations which are becoming obsolescent. On the other hand progress has to be gradual and must march *pari passu* with the general evolution of the army as a whole and the necessity for an intermediate and elastic organization or stepping stone not lost sight of. The training of the infantryman to manœuvre and fight on his feet has not been curtailed because he may one day occupy a "one-man tank." We want something to meet *present* conditions, even though these may be obsolete in a few years, and I suggest that one of the things we want *now* is more and better trained stretcher-bearers both regimental and R.A.M.C.

Under the conditions of mobile warfare, therefore, it often happens that little can be done in the way of systematically clearing a battlefield of casualties while an action is in progress in the vicinity.

A certain number of wounded are likely to be missed by the regimental stretcher-bearers and lie where they fall. These casualties may be considerably scattered over the area of advance.

The work of the R.S.B.'s, under the conditions of rapid movement, may be limited to grouping wounded under cover and leaving them.

The problem, therefore, which may face the Field Ambulance Company is, not only to clear the R.A.P.'s but to search the area of advance for "groups" or isolated wounded which the R.S.B.'s have not been able to get to the R.A.P. This work is made more difficult by the very much wider frontages occupied by infantry in attack mentioned before.

In order to search broken ground systematically, or even to advance with comparative safety under casual shelling, etc., it is often necessary for

the regimental and field ambulance stretcher-bearers to assume a widely extended formation.

Unless some system of control and inter-communication is in force stretcher squads in extended formation are liable to lose direction and touch.

This system of control is comparatively simple and has been modified and adapted from that in use in infantry units. "Control" is of course more necessary with field ambulance bearers, as regimental bearers usually follow their companies.

II.—Instruction in Control by Whistle, Signal and Passage of Orders, Visual Training, etc.

All ranks should be instructed in the above as laid down in the chapter on "Section Drill" in "Infantry Training" and in the practice of extended formations adapted to the requirements of stretcher-bearers of regimental medical establishments and field ambulance companies. First of all as a short formal drill on the parade ground with moderate intervals between the stretcher squads and later with full intervals over broken country.

As a stretcher squad often has to act independently the training of the "Nos. 1" is highly important.

The necessary signals (see Appendix II) for inter-communication and control when in extended order are to be found in "Infantry Training" (Vol. I, Chap. V) (with one exception)—they are easily learnt.

The passage of orders down a widely extended line requires practice and is essential as it is not always possible to use the whistle to call attention, and it should never be used in the neighbourhood of other troops.

All ranks should also be trained to recognize short distances, i.e., 25, 50 and 100 paces, by placing men at these distances and noting their height compared to a finger held vertically at arm's length.

(A cricket pitch is roughly 25 paces—a man at 100 paces corresponds in height to the width of a finger-nail with the hand held at arm's length.)

Instruction in the principles of "Visual Training" and the "Clock and Finger" method of describing features in a landscape (see Appendix III) should also be given. Further details may be found in "Infantry Training."

III.—Extended Formations.

The following extended formations which may be known as "first extension" and "second extension," are applicable to units consisting of several stretcher squads or to single squads acting independently (regimental stretcher-bearers for instance).

A.—First Extension.

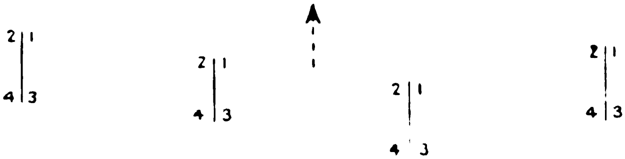


Fig. 2.—(The numbers shown are those of bearers as laid down in the new stretcher drill.) Four stretcher squads in the "first extension."

This formation is suitable for the following conditions :—

(1) When searching open ground where casualties can easily be seen.

(2) As a protection when the bearers are liable to casual shelling, indirect fire and "overs."

(3) As a method of concealment under certain conditions (Air Craft).

(4) As a preliminary formation to "second extension."

Note.—(1) The extension between squads, except for practice purposes, should seldom be less than 30 paces (as the lateral spread of shrapnel is some 25 paces), and need seldom be more than 100 paces.

(2) Before moving off in extended order landmarks, etc., should be pointed out to the directing squads on which they will march and so keep direction.

(3) Under difficult conditions both centre and flanking squads should be given these landmarks as a guide.

In order to indicate a landmark quickly the "clock and finger" method must be known (Appendix III).

Movements for Assuming First Extension.

Preliminary Formation.—Squads numbered, sized, and formed up in close order with stretchers, standing at ease.

Word of Command	Detail
1. "*From the Right (left or No.... Squad) to..... ... Paces—Extend*," or appropriate signal (the number of paces being given verbally)	Squads come to attention, lift stretchers, extend laterally in quick time, turn to their front when in position, lower stretchers and stand at ease
2. "*Right (Left or No.... Squad) directing* — (here give the landmark)—*Advance*" (or signal or order passed down line)	Squads come to attention, lift stretchers and advance
3. "*Retire*" (or signal, or order passed down line) If when retiring it is required to "advance" the signal for "about turn" is given	Squads turn about towards the stretcher the Nos. 2 and 4 carrying it in their left hands* (see *Note*) The directing squads select fresh points to march on
4. "*On the Right (Left or No. ... Squad)—Close*" (or signal or order passed down line)	Squads halt, if not already halted, lift stretchers, close laterally in quick time, turn to their front, lower stretchers and stand at ease

Note.—* This rests the Nos. 2 and 4 and facilitates instruction.

If permanent stretcher squads have been formed the Nos. 1 of each squad can be posted as markers and the order "on Nos. 1—Fall-in" given.

Remarks.—As intervals may be wide, extending and closing and changing direction when extended must be carried out "at the halt" and in quick time only, i.e., not at the "double."

If squads, in close order, are required to extend facing a flank or to the rear they must be wheeled in close order and halted when facing in the required direction "change direction right (or left), right (or left) wheel" (see Platoon Drill, 1914).

Whenever direction is changed the directing squads must be given a new point to march on.

B.—Second Extension.

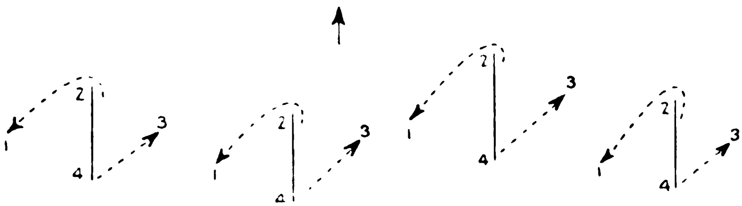


FIG. 3.—The intervals between bearers is one-third of original extension. Four squads in "second extension": intervals between stretchers as in "first extension."

This formation is suitable for the following conditions:—

(1) When searching broken country or in heavy undergrowth.

(2) When liable to rifle fire as when working close behind troops (R.S.B.'s).

(3) When operating in the dark. In this case it is an advantage for the bearers to wear a piece of white paper or cloth fastened on their backs (see fig. 3).

Special Signal.—As there is only one signal in Infantry Training for "extend" a special signal is necessary to order the "second extension.' See No. 7, Appendix II.

MOVEMENTS FOR ASSUMING "SECOND EXTENSION."

Preliminary Formation.—Squads in the "first extension" either at the halt or on the move.

WORD OF COMMAND	DETAIL
1. "*Second - Extension*" (or special signal or order passed down line)	Nos. 1 and 3 bearers double out from their squads, No. 1 proceeding to the left and No. 3 to the right and form (with the Nos. 1 and 3 of other squads) an extended line The intervals between the Nos. 1 and 3 being one-third of the interval between stretchers
2. "*First—Extension*" (or special signal or order passed down line)	Nos. 1 and 3 bearers double back to their stretchers and re-assume "First Extension"
3. "*On the Left* (*Right or No.... Squad*)—*Close*"	Squads whether in "First" or "Second Extension" close into "close order" on the squad named

Note.—If squads in the "second extension" are ordered to "retire," the Nos. 2 and 4 will turn about (towards the stretcher).

Preliminary Practice in Extended Order on Parade Ground.—Squads should be practised in advancing, retiring, halting, doubling, lying down, changing direction and inclining by orders, whistle and signal and orders passed down the line.

When practising these movements it must be impressed on the men that correct direction, interval and lateral touch are essential—there is however no need to keep a "dressed line."

The pace should be steady (about two miles per hour) as in later practices some squads may have to cross difficult ground.

If the parade ground is limited in size, moderate intervals in "first extension" to ten or twenty paces may be used.

The directing squads however must always be given a point to march on.

(*To be continued.*)

"FIDO" JEPHSON.

By A. G. C.

When Bimbashi Eustace Jephson was sent to the Bukra-Malesh Province of the Anglo-Egyptian Sudan as Senior Medical Officer he considered himself very fortunate; and he was right. At the back of his mind there was also an idea,—well, hardly that—perhaps a subconscious sensibility would be better, though that does not really express it either; well, anyway, to put it plainly he felt, though nothing would have induced him to say so, that the Anglo-Egyptian Sudan in general, and the Bukra-Malesh Province in particular, had every reason to be satisfied as well. And again, curiously enough, he was not far astray.

Eustace Jephson was, in fact, a smart young officer, a very capable surgeon and a very nice young fellow, though at the time of his arrival in Bukra the two latter qualities had been somewhat overlaid by the former.

It will not be necessary to review in detail the previous career of this promising youth, but a few words of explanation must be appended to account for his presence in the Bukra-Malesh Province in that year when he won for himself a reputation, and a nickname which is still remembered.

As a schoolboy the acquisition of knowledge presented few difficulties to him and he achieved a sound education without any acute mental effort. In addition to this he proved himself, after six summers of intensive culture, to be a very pretty bat, a result which won for him a popularity among his associates and also, perhaps, among his masters, which was far greater than any which he could have acquired by an equal proficiency in any other branch of the school curriculum.

It was this cricketing prowess which led to his subsequent leaning towards a military career, for his first view of himself in the brightly-coloured blazer of the School XI convinced him that the gay trappings of an officer would become him far better than the sober garb of the civilian. On this subject, however, he found that his father had very different opinions, and as Eustace's launching on life was wholly conditioned by the parental purse, the year after his leaving school found him entering with distaste, flavoured albeit with a touch of curiosity, one of London's famous hospitals as a student of medicine.

The next five years of his career were passed in strenuous study, for, contrary to his expectations, Eustace Jephson found a real interest in the pursuit of medical knowledge. It would have been comparatively easy for him to have graduated without undue exertion, but he went in for hard reading and quiet living, with the result that he was launched on the world

at the end of his course as a very highly qualified young surgeon, for whom all his teachers prophesied a brilliant future.

During the larval stage of his student life, Eustace had looked forward to the butterfly existence of the doctor, but now that he himself had acquired wings the brightness of his future was marred by thoughts of the struggle for existence, the horrid necessity of sending in bills for services rendered, and the fear that these services might seem to his future patients small in comparison with the monetary value placed upon them.

It was while he was still in this state of doubt and indecision that he fell in with one of his old schoolfellows. Dr. Jephson, pale and fine-drawn from his recent studies, was recuperating in the stimulating atmosphere of the promenade of the "Empire," when there entered to him one of those charming youths known to the reading public as "a clean young Englishman." His evening dress was faultless, his hair was smooth and shining, and the honest scarlet of his face spoke of long hours of exposure to sun and wind. The pimply schoolboy of the Army class was almost unrecognizable in the subaltern home from India on his first leave, and yet recognition was mutual and immediate.

"Hallo, Juicey!" cried the young hero.

"Hallo, Spotty!" answered Eustace a little shyly, and thought to himself, "Upon what meat doth this young Cæsar feed, that he is grown so great?"

"I say, we can't talk in this infernal bar," cried "Cæsar," in a lordly manner. "Come back to the Club and have a drink."

And that was the first step which Eustace took along the path which led him to the Bukra-Malesh Province.

A month later the name of Jephson, Eustace C., headed the list of successful candidates at the examination for entrance to His Majesty's Royal Army Medical Corps, and in due course Lieutenant E. C. Jephson, very much the soldier after his two months on the square at the Depot, and with his medical knowledge just the least bit dimmed by the glamour of it all, found himself reporting to a grey-haired officer who regarded him without enthusiasm as he threw off his best salute. This elderly gentleman appeared to be chiefly interested in finding out the extent of Eustace's medical attainments, and, after a prolonged questioning, he was assigned to the headquarters hospital of the Command as assistant to the surgical specialist.

Six months of this duty was enough to convince Lieutenant Jephson that efficiency (at any rate in the junior ranks of his branch of the Service), like virtue, has to be its own reward; for while he himself worked at difficult and responsible tasks, his contemporaries, on more detached and less important duties, seemed to lead lives of gentlemanly ease while in receipt of exactly similar emoluments.

Now it is not at all a pleasant situation when a young man sees all the sweets of life being gathered, without apparent effort, by those whom

he regards as his inferiors in mental as well as in physical attainments, while he himself is compelled, by reason of the very gifts which are his pride, to practise a way of life which he considers to be the acme of austere virtue.

Mr. Jephson had not at this time attained that altruistic detachment which later became him so well—in theory—when lecturing to his juniors, and hence, when a senior officer, who was on the look-out for likely youngsters for the Egyptian Army, approached him with a view to sending in his name for that service, he was very ready to fall in with any suggestion which might bring about a change in his unhappy lot.

His application was forwarded in due course, but, as it turned out, relief came to him from another quarter, for the name of Lieutenant Jephson appeared unexpectedly at the head of the roster for foreign service, and in the murky dimness of a November afternoon he left Tilbury Docks for India.

And now his luck seemed to have taken a distinct turn for the better, for he did not travel, as did most of his contemporaries, on a hired transport where he would have to have taken his turn at all the usual duties, but as a gentleman of leisure on a P. & O. liner, where, for three delightful weeks, he ate, slept and drank his gins and bitters without a thought of the morrow.

The voyage passed very pleasantly. At deck sports Mr. Jephson not only shone, he scintillated, and, in the appreciative atmosphere which his proficiency created, he blossomed like a rose. Nor did his expansion stop here, for, one of the passengers happening to fall grievously ill with appendicitis, and the ship's doctor being more physician than surgeon, Lieutenant Jephson volunteered his assistance, and performed a very creditable operation in the Indian Ocean and landed in Bombay with the thanks of the patient and the captain ringing in his ears and with the comfortable feeling that he had added to the prestige of his Corps.

Thus successfully launched on his career in India, his lot was a very pleasant one, and for eighteen months he triumphed not only in the sphere of his professional duties and in the domain of sport, but he proved also that he could shine in the boudoir.

His capability in this latter direction would have landed him an unwilling victim at the altar but for the timely intervention of Chance, which arrived in the form of a War Office telegram to the effect that the Government of Egypt had requested that the services of Lieutenant E. C. Jephson might be placed at their disposal, and that the transfer would take place immediately on the receipt of the said officer's assurance that he was willing to pay the passage of his successor to India.

The price was heavy but the alternative loomed to his disillusioned eyes as absolutely crushing. He had seen enough of the struggles of married subalterns not to realize that the reward would have to be great indeed to compensate for the loss of his independence, and he was by no

means sure that, in this instance, the reward was as great as it had at first appeared.

The severing of Mr. Jephson's connexion with India was painful and, like all painful operations, the less said about it the better. The verdict on his case may be summed up in the words of one of the more important ladies of the station, his prospective mother-in-law, to be exact: "He seemed such a nice boy," she said; "he ought to have gone far."

He did, and as fast as possible!

. . . .

And so, in due course, Eustace arrived in the land of Egypt and, after a brief stay in Cairo, where he obtained the necessary uniform and a cook, and a rather longer sojourn in Khartoum to pick up the rudiments of his new duties, he found himself en route for Bukra, capital of the Bukra-Malesh Province.

Everyone in Bukra was kind to Bimbashi Jephson from the start. He was really a very nice young fellow, though he was but an indifferent shot and only a very moderate horseman. He played polo with a detachment born of inexperience alike of the game and of his ponies, but it was generally conceded that when he could bring himself to concentrate more on the movements of the ball and less on the set of his breeches and the flashing brilliance of his boots, he had in him the makings of a respectable player. His occasional spasms of reckless and dangerous riding were treated no more seriously than are the sharp pricks caused by the pin-like teeth of a playful puppy. Mr. Jephson thought it unfortunate that he was unable to demonstrate his real talent for cricket and tennis and golf, these pastimes not having at that date taken root in the desert soil of this outpost of Empire, but he allowed it to be known, in confidence, that he had been tried for his county, a fact of which he was justly proud. He was a little hurt, however, when he was shortly afterwards introduced to an officer, who had arrived in Bukra from one of the outlying stations, as the best cricketer in the Province. The hint was well meant and he had sufficient sense to profit by it, and soon came to realize that, for the small circle of officials in the station, his doings, prior to his arrival among them, had extraordinarily little interest.

The great point in Eustace's favour, and he was slow to recognize and loath to acknowledge it, was the fact that he still remained a really good doctor. Shortly after his arrival in Bukra the Governor of the Province had occasion to consult him with reference to an obstinate and distressing affliction from which he was suffering, and the rapidity with which the symptoms yielded to Eustace's skilful treatment went far to counteract the impression, which was being formed among the older inhabitants, that Bimbashi Jephson was just an ordinary young fellow.

In dealing with the darker skinned races it is not quite enough to be just ordinary. It matters little in what way the stranger is out of the common, but some distinguishing feature he should have; some handle,

some subject for a nickname, some idiosyncrasy of voice or gesture which will separate him from his fellows; for only by such, or by some outstanding deed, does he escape the oblivion into which the majority sink as soon as they are out of sight.

Bimbashi Jephson had no such characteristic by which he could be placed. He was, to all seeming, just a "clean young Englishman." After six months' sojourn in Bukra he remained the same, though, perhaps, not quite so "clean," except that his skill as a surgeon had earned him a respect among his fellows and much goodwill from his patients.

He was destined, however, to achieve for himself a nickname and a tradition which lasted him through all his ten years' service with the Egyptian Army and threw into the shade all his temporary faults, which, after all, were but the faults of youth, like tonsils and adenoids.

The circumstances leading up to the accident by which he acquired his cognomen originated in the theft of a carbine from one of the soldiers of the detachment under Bimbashi Jephson's command. Towards the end of April several of the men of the Medical Corps detachment in Bukra became time expired and their places were taken by more or less raw recruits from Khartoum. Soon after the change had taken place Bimbashi Jephson had occasion to comment very strongly and unfavourably upon the way in which one of his patients was carried on a stretcher from the operating table back to his ward. During the course of his strictures he asked his Syrian medical officer, Yuzbashi Abu Effendi Wahid, whether these infernal recruits had had any instruction in stretcher drill. He was informed, "Of course, sir—at the depot, sir—and here, sir, also, once a week."

"Well," said Bimbashi Jephson, very fierce, "have them out in full kit to-morrow afternoon at 4 o'clock and I'll see how much they know."

The next afternoon accordingly, Bimbashi Jephson, very smart in breeches and boots and with his trusty blade at his side, spent two moist and blasphemous hours over his young entry. His fierceness terrified the inexperienced youngsters, and the fact that they understood but little of his very Sudanese Arabic (and poor at that!) made matters worse, for Eustace did not care to employ his native officer as an interpreter, preferring to make up by extra loudness what he lacked in fluency.

At length the rapid darkness of these latitudes began to fall and the stretchers were closed for the last time just outside the gate of the hospital compound. One of the orderlies was more than usually clumsy and, as he tried to adjust the buckle of the sling of his stretcher, his carbine kept slipping round his shoulder and getting in the way. All the rest of the detachment were waiting on this one man and the darkness was now nearly complete. At length Eustace could stand it no longer.

"Take off that damn gun," he roared, "and put it on the ground until you have the stretcher ready."

Rapidly Yuzbashi Abu Effendi Wahid rendered this command into the

native tongue; the carbine was unslung and laid on the ground; the stretcher buckled up correctly, and the little party sprang smartly to attention, all ready to be dismissed from parade.

Bimbashi Jephson had just squared himself to give off the word of command, and the warning "*Company!*" was, in fact, issuing from his lips, when from the angle of the wall surrounding the hospital a stealthy form slipped quietly, seized the fallen carbine with one swift movement, and was away into the gathering darkness before the horrified Bimbashi could utter a word.

Now Eustace Jephson had one quality which several times in the course of his life stood him in good stead; in moments of sudden emergency he acted at once, without suffering from that paralysing second of immobility which too often allows the golden opportunity to slip by unseized.

The instant, therefore, that saw the thief disappearing in the direction of the town saw also Bimbashi Jephson hard upon his tracks, his company left standing with open mouths, and all faculties of thought, speech and action for the moment disconnected. By the time that sensation was restored, the only sign of their commanding officer was the rapidly diminishing sound of his yells and curses coming back to them through the gloom.

The military cantonments of Bukra are separated from the town proper by a broad and open *maidan* about a quarter of a mile wide. Across this space fled that gifted opportunist, Mr. Koko Wad Riskallah, the stolen carbine hugged tightly in his left hand, and after him, at full speed, came Bimbashi Eustace Jephson, despair in his heart and fierce curses on his lips.

The odds were, of course, all on the lightly-clad Sudanese, and Koko Riskallah was, in fact, already calculating whether it would be better to purchase two inferior wives or one good one with the price of his loot, when his left foot stepped suddenly on a very sharp and jagged piece of thorn bush which had been dropped on the *maidan* that very morning by a gentleman who was bringing thorn trees into the town to repair the *zeriba* in which he kept his goats.

Koko Riskallah tripped and fell, recovered himself, limped a few yards, but had to stop and drag the projecting thorn from his foot before he was able to resume his flight at a much slower and more painful gait. Still, he was now very close to the nearest houses and safety, and, though his pursuer had profited fully by the delay, the fugitive did not give up hope of escaping safely with his booty. But at this moment a new actor appeared upon the stage.

A policeman, strolling home to his supper, had heard the shouts of the infuriated Bimbashi, and though the words were unintelligible to him, he grasped the fact that something unusual was toward and quickened his pace to a run.

As the policeman emerged from the shelter of the houses on to the *maidan*, Koko Riskallah was in the act of darting into the blackness of an

adjoining street about thirty yards to his left, and the sight of this new arrival warned that quick-witted son of the desert that he must alter his arrangements, and that speedily.

Dodging out of sight round the high mud walls of the nearest enclosure, his nose apprised him of the fact that a heap of fresh *zibla* was at hand, and, with a quickness of decision which rivalled Bimbashi Jephson's own, he flung the incriminating carbine into the pile of semi-liquid unpleasantness (where it immediately sank from view) and, turning about, he walked quietly back along his tracks, round the corner of the wall, and straight into the arms of Bimbashi Jephson and the policeman.

Before the subsequent adventures of Mr. Koko Wad Riskallah and his pursuers are recounted, a word must be inserted as to the nature and properties of that unpleasant compound which is known in the vernacular as *zibla*, for with this substance the rest of the tale is somewhat flavoured.

In the town of Bukra the better class houses and the *hoshes* or courtyards by which their inhabitants are screened from too curious eyes, are built of unbaked mud bricks. Now unbaked mud brick, while it makes a cool and comfortable dwelling, has a regrettable tendency to lose its brick-like form under the influence of the heavy rains of the summer months. To meet this tendency to dissolution, the native builders have evolved a simple and effective remedy. Shortly before the first rains are due, the plasterers collect from the surrounding plain the dried excrement of the herds of cattle, camels, sheep, and goats (or so at least it is stated in Bimbashi Jephson's Intermediate Annual Sanitary Report), and this matrix is powdered and mixed with sand, chopped straw, and water, until a homogeneous mass is formed. When first mixed, it is very malodorous (in spite of the statement to the contrary in Bimbashi Jephson's Report), and in this state it is allowed to ripen for some days until it has reached the proper stage of adhesiveness, when it is applied like plaster to the walls, over which, when it has dried and set, it forms a very efficient protection against the weather.

It was in one of these ripening mounds that the stolen carbine was now lying concealed, not thirty yards from the spot where Bimbashi Jephson, the policeman, and Koko Wad Riskallah had just converged.

Breathless with running, Eustace greeted the officer of the law with, "Did you see the thief?"

"I saw a man," replied the other, with the caution characteristic of his class.

"Where did he go?" gasped the Bimbashi.

Before the policeman could reply, round the corner and almost into their arms walked that subtle tactician, Koko Riskallah.

"Ho! you man! Did you see the thief?" demanded Eustace.

"What does he say?" asked the simple Arab, turning to the policeman.

"He says, did you see a man running away?" replied that worthy.

"Yes," replied Koko, calmly, "I saw a man running that way," and he

pointed to the direction from which he had come, "He was carrying something like a stick in his hand, and he was limping a little."

Eustace caught the gist of the speech. "Quick; after him!" he yelled; and whirling the still sceptical policeman into the vortex of his initiative he dashed off again in pursuit, leaving the sweating Riskallah behind.

That gentleman, now perfectly safe, was preparing to conceal himself until such time as he could revisit his cache without fear of interruption, when suddenly there was a pounding of heavy feet on the sand, and in an instant he was surrounded by large and ponderous figures. The Medical Corps detachment had arrived!

The rapid double across the *maidan*, following closely upon two hours of hectic stretcher-drill, had in no way fatigued these stalwarts of the Nile Delta, but the unusual exercise had convinced them that they were being overworked. They had been ordered by their Yuzbashi to follow Bimbashi Jephson and help him to catch the thief. They had followed obediently at a heavy-footed run, had lost sight of the Bimbashi, had given up all hope of catching the thief, but here was a man who might, as well as any other, be he, and at any rate it was a heaven-sent opportunity to stop and have a chat. The serjeant therefore, rightly interpreting the feelings of the detachment, at the sight of Koko Riskallah, pulled up sharply, and seizing that startled gentleman by the arm, said fiercely, "Who are you?"

"He says, 'Who are you'?" cried the corporal, without waiting for an answer.

"Take him to the lock-up," put in one of the recruits, anxious to curry favour. "This is the thief, I saw him pick up the carbine."

That this was impossible was manifest to everyone present, but the idea appealed to them all as likely to afford a temporary solution of their problem—to all, that is, except Koko Riskallah himself, who, with a sudden twist, freed himself from the grip of the serjeant, and would have escaped, but for the fact that at this moment his path to freedom was blocked by Yuzbashi Abu Effendi Wahid, who arrived out of the darkness astride his donkey.

This officer's portly habit did not lend itself readily to active pedestrian exercise, and he had therefore wisely refrained from taking part in the pursuit until the arrival of his donkey had permitted him to do so without the risk of undue fatigue. His arrival, as it turned out, could not have been better timed.

"What is all this?" he demanded, when the fugitive had once more been secured.

"This is the thief!" replied the serjeant; "Ahmed here recognized him and we are taking him to the *zabtieh*."

At this Koko Riskallah burst in in his defence. "I am a poor man, your honour," he cried; "I am no thief. I was walking out like the people when these men came upon me and seized me."

"Where is the carbine?" demanded Abu Wahid.

"I don't know anything about a carbine, your honour," wailed Koko Riskallah. "I saw a man just now running, and an officer and a policeman following him, perhaps he was the thief."

"Where was that?" asked the Yuzbashi.

"Close here; I will show your honour, come with me," said the Sudanese, hope beginning to rise again in his breast.

At this moment, however, there came the voice of Bimbashi Jephson out of the darkness on their left, calling out to know who was there. The Yuzbashi answered him, and presently the breathless and weary Eustace joined the group, followed by the policeman.

The story of the capture of Koko Wad Riskallah was quickly told, and again the accused began to protest his innocence in moving terms. "Where was the carbine?" he was asked. He denied all knowledge of any carbine; did not in fact know what a carbine was; was it a kind of rifle?

Eustace was beginning to wonder what he ought to do. His inclinations prompted him that it was better to have an innocent prisoner than no prisoner at all; still he could not have the man arrested on the incredible story of his recognition by Private Ahmed who, as Eustace was well aware, had had his back turned at the moment of the theft.

Just then the serjeant, who was holding Koko Riskallah, said, "This man is very hot, he is sweating much; I think he has just been running; assuredly he is the thief."

"I have fever," countered Koko swiftly; "I have had it for three days; I vomit all the time."

A light shone forth in the darkness of Bimbashi Jephson's mind. "Take him to the barracks," he said to the Yuzbashi. "See what his temperature is. If he has fever keep him in detention, for he may be a danger to the public. If he has no fever keep him in detention as a suspected thief. He will be brought before the Inspector in the morning. In the meantime get lanterns and as many men as you can and search all the ground between here and the hospital to see if you can find the carbine, and also, if you cannot find it now, have another thorough search made at daybreak."

With these words Bimbashi Jephson, feeling that he could do no more until the morning, turned away with a heavy heart to find what solace he could in a hot bath, clean clothes, and a vermouth and bitters before dinner.

At an early hour the next morning Eustace received a report from the Yuzbashi to the effect that no trace of the missing carbine could be found and that the prisoner had had no sign of fever since his apprehension.

An official report of the occurrence had, therefore, to be rendered at once to the Governor of the Province and, before the morning was out, Bimbashi Jephson learned the fact (a fact of which he was already only too well aware) that the loss of a rifle was a very serious affair; that a

Court of Inquiry would have to be convened, and that in the meantime he was to take all possible steps to recover the missing weapon.

He had also to listen to some very acidulated remarks from the Senior Inspector, to the effect that it was not in accordance with the principles of justice that peaceful civilians should be arrested and detained under a military guard on quite unfounded suspicions, in stations where there existed perfectly adequate machinery in the hands of the civil authorities for dealing with crimes like theft—if indeed it could be called a theft to pick up a rifle which had been left lying about by a careless Egyptian orderly who, by rights, ought not to have been trusted with a rifle at all.

As may be imagined, it was a very chastened and gloomy Eustace who turned out to play polo that afternoon ; and his spirits were still at a low ebb as he sat on the roof of the Mess after the game drinking his whisky and soda in silence and listening enviously to the care-free talk of his companions.

About an hour before dinner, and just as people were beginning to think that it was time for a bath and change of clothes, the notes of a bugle from the guardroom of the battalion rang out on the silent air. The call was taken up by one bugler after another and everyone on the roof of the Mess, starting to their feet, saw at once the leaping flames of a fire in the town and realized that the troops were being turned out to assist. Shouts for horses were raised and, in an incredibly short space of time, all the officials were cantering off across the *maidan* in the direction of the blaze. All but one, that is, for Bimbashi Jephson's *syce* had brought round for his master, not one of his steady-going polo ponies, but a wild new animal from the south, a recent purchase, with a mouth like iron and paces resembling those of the chariot horses of the Pharaohs.

In the excitement of the sudden call to duty this wild beast proved difficult to mount and the unfortunate Jephson spent some minutes hopping round in a blasphemous circle, with one foot in the stirrup, while his companions clattered off into the dark.

Once on the pony's back, however, Eustace did not delay. With his reins held anyhow, in a sort of bunch, hatless, and with his open coat flying in the breeze, he gave his mount the spurs and bucked off into the night in the wake of his predecessors.

Before they reached the edge of the town he was upon them, now pulling furiously at the pony's mouth so as to fall into place at their side. As well might he have tried to stop a charging elephant. Through them he dashed, scattering them to right and left in his wild career and heading straight for where the fire glowed, now but three hundred yards ahead.

Up one of the streets of the town he fled, and with the glare of the conflagration in his eyes the blackness around him seemed like an impenetrable wall. How was he to know that this was the very street into which Koko Wad Riskallah had turned the previous night? How could he divine that that light-fingered gentleman himself was at that very moment taking

advantage of the darkness and the diversion caused by the fire to retrieve his booty from its noisome resting place?

But once more Riskallah was doomed to disappointment. Just as he approached the heap of *zibla*, Bimbashi Jephson came flying up the street as flies a leaf driven before a hurricane. With a bound Riskallah reached the safety of the wall. The flash of his grimy shirt almost under the nose of the charging pony caused that startled animal to execute a most prodigious shy and swerve; his forefeet struck the edge of the heap of *zibla* and on his nose he went.

Bimbashi Jephson had received at Aldershot a certificate to say that he could ride sufficiently well to perform the duties of a mounted medical officer, but if he had been Centaur himself the result could hardly have been different. As an arrow sinks up to its haft in the side of its quarry, so sank the hapless Eustace to his very boots in the horrid mound.

'Twas but a moment later that the Governor, the Officer Commanding, the Senior Inspector, and the others arrived on the scene. Another instant and they had flung themselves from their ponies, seized the projecting boots, and lugged the choking Jephson from his fæcal grave. Alas for his beautiful white breeches and scintillating boots! Alas for his neat sweater and regimental scarf!

But see! He waves some dripping object above his head! It cannot be—it *is*—the missing carbine!

Swaying on his feet and spitting the foul mud from his lips, Bimbashi Jephson grinned a sickly grin and, in quite a clear voice, shouted, "In Arduis Fidelis," the well-known motto of his celebrated Corps. Then he fainted.

"He rode a damn hot finish," said the Governor calmly. "Good old Fido." And Fido Jephson he remained.

Editorial.

REPORT OF THE MEDICAL RESEARCH COUNCIL FOR THE YEAR 1927-1928.

THE Council state that the linkage of Government research organizations for Great Britain with equivalent organizations in the Indian Empire and Dominions overseas has been maintained. At the request of the Government of India the Secretary of the Medical Research Council acted as chairman of a committee appointed to consider the establishment and location of a central research institute and its relation to other centres of research in India. The National Research Council of Canada is keeping the Medical Research Council informed of the progress of the large scale tests which are being made in Canada with Calmette's B.C.G. At the request of the Tuberculosis Research Committee of the South African Institute for Medical Research Colonel Lyle Cummins has visited South Africa and joined in their work. By means of his reports the Council have been able to follow in detail the study of the problems produced by the industrialization of races having widely varying degrees of natural immunity from the disease.

The Council are also co-operating with the Empire Marketing Board in researches on food problems from which it is expected that the community will gain improved foods of ascertained nutritive value.

The Council have also been asked to co-operate with the Pernicious Anæmia Committee of the Harvard Medical School in the trial of liver extract for the treatment of pernicious anæmia. Dr. Cohn, of Boston, found that extracts of liver may contain the unknown curative factor, and experimental work at the National Institute at Hampstead has led to a modification of the American process which has given good results. The Council then invited the co-operation of manufacturing firms and arranged for clinical trials of the extracts so obtained. Reports received from hospitals to which the extracts were sent have shown that the preparations are satisfactory.

In regard to the medical treatment by artificial ultra-violet light, as distinguished from sunlight which is now being used in a great variety of serious and mild cases, the Council point out that large sums of public and private money are spent without, in some cases, sufficient return for the money expended. The Council, while admitting that there is scientific support for the belief that irradiation of the skin produces vitamin D, state that there is no scientific reason to suppose that the treatment of rickets, or the supply of vitamin D to the body for any other purpose, is better affected by ultra-violet rays falling on the skin than by the direct

provision of the necessary food values. The use of artificial light to supply only what the right food can give is merely wasteful. It commonly costs three or four shillings to give by light an effective supply of vitamin D that would cost less than a penny if given by the mouth in the form of cod-liver oil.

Following on the discovery that the invisible rays of ultra-violet light had the nutritional powers of sunlight, it was thought that they might have a beneficial effect on child-life, and heavy expenditure was incurred in the provision of light treatment in schools and institutions. In 1925, Dr. Helen Mackay made careful observations on the effects of ultra-violet light given by the mercury-vapour light on the health of infants, subnormal in physique, from the East end of London. No evidence could be found of any gain in weight, of lessened anæmia, or of better resistance to infective disease in the treated group as compared with a similar group of untreated children. During the winter months of 1927-8, at the request of the Council, Dr. Dora Colebrook, with the assistance of Dr. Buchan, arranged another scientifically-controlled trial of the effects of light upon children at school. The results were entirely negative; there was no gain in height or weight, and the incidence of minor ailments, such as colds, was rather higher in those receiving the light.

The results collected from the artificial light centres provided by local authorities are stated in the Report of the Ministry of Health to show great variation in opinion as to the value of light treatment.

The Council say that they cannot find any properly controlled experiments which can be placed against those of Dr. Mackay and Dr. Colebrook.

There is no evidence that any results which have been achieved could not have been obtained far more cheaply by proper food, and if this be so, they say it is obvious that exercise and fresh air are preferable to indoor sessions around a lamp.

The Council state that the only other uses of the light radiations depend on their power to produce a local inflammatory reaction which can be controlled with some precision. Experiments made for them have shown that a weak inflammation of the skin, indicated by an after flush, does increase the power of blood-corpuscles, in shed-blood, to dispose of bacteria. But this increase in bactericidal power has not been correlated with any permanent effects of value in the body; it is quickly followed by a return to the normal, or even by a decrease in the bactericidal power of the blood. Exactly the same effects for good or evil follow inflammation of the skin blood-vessels caused by heat, or by irritants other than light. "There is no present reason to know that artificial light can do more in this way than a mustard plaster, which is infinitely cheaper."

The Council have thought it right to draw attention to the negative results as so many far-reaching claims have been made for the uses of artificial light. The Light Committee have not found any sound objective evidence of useful actions of ultra-violet radiation on the human body which

go beyond those indicated. On the other hand, the Committee have every confidence in the value of carefully regulated exposure of patients to natural sunlight, especially in such conditions as surgical tuberculosis.

Owing to limitations of space we are unable to deal with all the research work carried out by the Council, and have selected the work in the various sections which we think will interest our readers.

In connexion with his studies on cancer, Dr. Gye accepted an invitation from the Harvard Cancer Commission to visit the United States and demonstrate his methods. He made some experiments there with Dr. Mueller, but the results obtained were again unconvincing. Dr. Gye now believes that the disappearance of potency in a tumour filtrate on simple incubation is due to the presence of an oxidizing ferment. Dr. Mueller, of Harvard, has found that cystein, by virtue of its avidity for oxygen, is able to preserve the infectivity of an extract.

In 1920 the Council received from the Government 2½ grammes of radium element, and distributed fractions of this to twelve centres for combined pathological and radiological study, under the supervision of the Radiology Committee. Later the amount of radium in use was increased by another third, received from the British Empire Cancer Campaign, and other sources.

The Committee received each year reports from the centres, and the progress made during the seven years is now reviewed. The Council state that the outlook has been quite transformed, and in place of random empiricism, definite technical methods have been worked out for the treatment of cancer by radium for almost every region of the body, except the stomach. It can now be said with confidence that any woman suffering from early cancer of the neck of the womb can have the disease surely removed by a course of radium treatment. Radium has also proved to be the best means of treating inoperable cases of cancer of the tongue, and in operable cases it removes the growth without mutilation and gives good functional results.

In the case of cancer of the breast and cancer of the rectum, similarly good results seem likely to be obtained.

In 1921 the Council undertook, with the co-operation of the Ministry of Health, to investigate the modes of detecting tuberculosis in cattle. Inquiries were conducted by the Tuberculin Committee, and after four years' work they reported that the subcutaneous tuberculin test was often fallacious, and recommended the double "intradermal" test. In 1927 reports were collected from nearly eighty veterinary surgeons using the test in different parts of the country. The vast majority of practical men now regard the new test as much more trustworthy than the old one. Of 835 animals that had given no reaction with the old test and had been passed free from disease, 122 reacted to the new intradermal test; of these only 94 could be secured for the post-mortem test, but every one was proved to be tuberculous.

Taking advantage of the methods worked out for the preparation of tuberculin, Mr. Dunkin, of the Council's Farm Laboratories, has worked out a diagnostic agent "Johnin," for the detection of Johne's disease in cattle. This disease is not easily recognizable in its early stages, but later causes emaciation, loss of milk in dairy cows, and death. It has often been mistaken for tuberculosis. There is no known cure, and the only preventive measure is early detection and removal of the infected animals. By intradermal injection of Johnin the disease can be detected in its early stages, and some owners have been startled to find as many as 40 per cent of a herd infected. It seems probable that Johne's disease will be revealed as causing a greater loss to the stock owner than tuberculosis. By its interference with the milk supply the disease is a direct menace to child welfare.

At the National Institute for Medical Research, work on the vasodilator constituents of different tissues of the body has been facilitated by the installation of machinery for preparing and concentrating extracts of fresh tissues on a small manufacturing scale. The substance histamine has been shown to be responsible for the most important activity of this type in the extracts from a series of organs. Histamine has been shown to be a normal constituent of lung, liver, and muscle, and it is becoming apparent that histamine must be recognized as one of the chief factors in the localized control of blood-circulation.

Rosenheim and Webster have continued their researches on the production of vitamin D; but have not been able to produce any vitamin activity by the irradiation of sterols which often accompany ergosterol, and this substance retains its unique position as the only known parent of vitamin D.

In the department of experimental bacteriology Bruce White has been working on the factors which determine the pathogenic and toxic properties of the Salmonella group of organisms associated with food poisoning. Some of his experiments suggest that carbohydrate substances extracted from various species of these organisms, though innocent alone, may have definite aggressive properties, and if injected along with living bacilli of the type from which they are derived may facilitate infection and increase fatality. By the use of the Millon test for protein he has shown differences between the rough and smooth varieties of a given organism. The smooth type also gives a more intense response to Molisch's test for carbohydrate than the rough type of organism.

In applied physiology, the view of Dr. Hill and Dr. McQueen that the capillary blood-pressure does not suffice to produce filtration of fluid in the glomeruli of the kidneys or elsewhere has been confirmed, and fresh evidence adduced that the passage of fluid in and out of the capillaries is controlled by the living endothelial wall and the tissue cells.

Captain Douglas, Dr. Wilson Smith and Dr. Hill have investigated the effect on droplet infection of spraying a room with antiseptic solutions.

An emulsion of *B. coli* was sprayed into a room and distributed by means of a fan. The fan was then stopped and sterile plates were exposed after intervals of time. Spraying the room during an interval, particularly with hypochlorite solution, had a great effect in diminishing the number of microbes. The use of such sprays in crowded public rooms appears to be justified.

In connexion with this preparation of standard cultures and sera, it was thought desirable to investigate the question of the small clumping ("O") agglutination in typhoid fever, with a view to the eventual preparation of standardized "O" suspensions for supplementing the ordinary Widal reaction. It was found that Dr. Felix's statement that "O" agglutinins are not formed in response to typhoid or T.A.B. inoculation does not hold good. Suspensions of typhoid bacilli made by treatment with alcohol and standardized for sensitiveness to "O" agglutinins are now obtainable from the laboratory for the testing of sera of clinically typhoid cases which give a negative Widal reaction, and of suspected typhoid fever in inoculated persons.

The staff of the laboratory has undertaken to produce standard agglutinable cultures and agglutinating sera for *B. abortus* to assist in the diagnosis of obscure cases of undulant fever which are not infrequently met with at the present time.

At St. Thomas's Hospital medical unit Professor Maclean and his colleagues have continued their researches into the physiology of digestion. They find that the reduction of hydrochloric acid during the later phases of digestion is in no way dependent on the regurgitation of alkaline fluids from the intestine. Their experiments show that the stomach secretes not only hydrochloric acid, but sodium chloride as well, and they believe that the increase in sodium chloride associated with the normal fall in hydrochloric acid is due to direct secretion by the stomach and not to the neutralization of acid by regurgitant alkali. The stomach possesses a self-regulating mechanism for acid; the secretion of gastric acid ceases in normal persons when the hydrogen-ion concentration reaches a certain value, and by this automatic regulation the stomach controls the acidity of its contents. The secretion of pepsin has no relation to the amount of acid in the stomach, but there is a definite relationship between the concentration of sodium chloride and the amount of pepsin secreted.

Further work has convinced Professor Maclean that the ordinary case of ulceration of the stomach can be cured by the intensive alkaline treatment described in the last report, and that surgical interference is unnecessary in uncomplicated ulcers. Patients with adhesions may fail to respond, but the evidence now obtained suggests that even these cases may do quite well.

At Sheffield, Professor Mellanby has continued his experiments to determine the chemical properties and nature of the substance present in cereals which interferes with the calcification of bone. It has been shown

that oatmeal is in this respect the worst, and white flour the best, of the cereal products; that the germ of grain is particularly active in opposing calcification; that sources of ultra-violet radiations acting on the cereals antagonize the anticalcifying effect, but do not destroy the substance itself; that other sources of vitamin D oppose the anticalcifying effect of cereals, and that additional calcium in the diet, especially in the form of the carbonate, mitigates the cereal effect.

Professor Mellanby has succeeded in extracting from ergot a substance which appears to be identical with vitamin D. It is not clear how vitamin D is formed in ergot. We might suppose that it was due to sunlight striking the ergotized grain, but exposure of ergot to strong sunlight did not increase its vitamin D content.

After the discovery that vitamin D is the great antirachitic factor it was usual to describe vitamin A as the growth-promoting fat-soluble vitamin, but this was obviously erroneous when it was found that vitamin D had this specific influence. Professor Mellanby's work now supports the conclusion of other workers that vitamin A has a most important influence in maintaining the resistance of the body against infective and pyogenic agents.

Dr. Cowell, at Sheffield, has found vegetables, especially summer-grown green vegetables, have a powerful protecting influence against inflammatory changes in the kidney, and thereby prevent a high non-protein nitrogen accumulation in the blood. The exact nature of the agent is not yet known. Milk and cereal foods have no protecting action.

At University College Dr. Harris has been working on the rôle of the vitamins in relation to bone formation. The proliferation of cartilage, he believes, is under the control of water-soluble, growth-promoting products of the nature of vitamin B, the calcification of cartilage, a manifestation of senescence, is promoted by vitamin D, ultra-violet light, or any of the preparations of irradiated ergosterol; true osteogenesis, with the formation of active osteoblasts is promoted by the fat-soluble vitamin A. Vitamin D, or ultra-violet light, controls the calcification of the excessively proliferated cartilage, but vitamin A alone guarantees active differentiation of osteoblasts. The anæmia of scurvy is shown to be not only a consequence of the active hæmorrhages, but also a primary anæmia due to the failure of differentiation of bone-marrow into typical erythroblastic and leucoblastic areas. Gelatinous marrow is formed during the period of dietetic deficiency, and on administration of orange juice the re-differentiation of the marrow takes place at the juxta-epiphysial zone in the region of the young and active capillaries.

Research work for the Empire Marketing Board has been carried on at the Lister Institute under the direction of Professor Harden. A representative sample of West Indian honey and a sample prepared under known conditions at the Rothampsted Experimental Station have been tested for their vitamin A, B, C and D content. The results show that both

honeys do not contain any significant quantity of these vitamins. Samples of New Zealand butter prepared under carefully controlled conditions in 1928 have been tested for vitamins A and D. The data so far available point to the fact that these butters are rich in both vitamins.

Professor Drummond has continued his examination of the clinical nature of vitamin A as it occurs in various fish-liver oils. It has been ascertained that the amount of vitamin A in cod-liver oil is so small that direct chemical effort towards its isolation is not worth while at present. It is probable that the vitamin constitutes less than a ten-thousandth part of the cod-liver oil. "Biosterin," claimed by the Japanese to be vitamin A, contains probably less than 0·1 per cent of the vitamin itself.

Dr. Morton has shown that concentrates of vitamin A display an absorption band in the ultra-violet that can be associated quantitatively with vitamin A. In concentrations of known biological activity there is a striking parallel between the intensity of the absorption band discovered by Morton and the response to the colour reaction of Rosenheim and Drummond.

It seems probable that the biological test will be abolished in favour of the chemical colour test, or of the optical measurement of the absorption band.

At King's College, London, Dr. Hartwell has continued her studies on synthetic diets with the object of obtaining a diet which will give a maximum growth curve. It has been shown that different proteins require different amounts of vitamin B, and that the moiety responsible for catalysing protein material is the heat-stable, or anti-pellagric, vitamin.

At St. Bartholomew's Hospital, Dr. Williamson has found a method of separating the two secretions of the thyroid gland, so that their biological, physiological, and clinical activities can be separately tested. The colloid secretion contains all the iodine and all the thyroxin of the thyroid. The other secretion, called the "lymphogenic," is believed to be solely responsible for Graves' disease. The relation of this disease to iodine metabolism has been studied, and the colloid substance has been found not to be responsible for the toxic factor in this disturbance. The danger of treating simple goitre by iodine or thyroxin has become apparent by studies which have shown that the lymphogenic action of the thyroid can be stimulated and the toxicity of the gland aggravated or induced by iodine, thyroxin, or thyroid-gland treatment.

At Cambridge, Dr. Stanley Griffith has not been able to confirm Calmette's conclusion that ingestion or inoculation of B.C.G. can give complete protection in monkeys against an infection with virulent tubercle bacilli. On the other hand, an absolute immunity has apparently been produced in a calf by intravenous injection of B.C.G. Experiments are now being made by Professor Buxton to find the relative value of the methods of giving the vaccine, and those completed show that immunity can be produced by intravenous, subcutaneous or oral administration. Two

calves fed by the last method have resisted completely the intravenous injection of one milligramme of virulent bovine bacilli, which would have killed them without it in less than twenty days.

At the hospital for sick children, Glasgow, Dr. Blacklock has investigated a further twenty cases of fatal tuberculosis, bringing the total number in which the infecting organism has been isolated up to eighty-four.

The results show that eighty per cent of primary abdominal tuberculosis is due to the bovine bacillus and ninety-six per cent of primary pulmonary tuberculosis is due to the human type.

Dr. Eagles having shown that a toxin very similar to that which reacts in the Dick test for scarlet fever is associated with the streptococci of puerperal fever, Dr. Burt-White applied the test to 100 prospective mothers in St. Bartholomew's Hospital and the City of London Maternity Hospital, and found there was a close correlation between a positive Dick test and subsequent puerperal sepsis. This correlation suggested the possibility of rendering Dick-positive patients immune to puerperal fever before labour, and arrangements have been made for a thousand cases to be investigated at the City of London Lying-in Hospital and Queen Charlotte's Hospital. It is anticipated that a means of prophylaxis may be made available for ante-natal cases who are shown by the Dick test to be susceptible to puerperal fever.

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE.

The new building of the London School of Hygiene and Tropical Medicine was opened by the Prince of Wales on July 18.

In the course of his address His Royal Highness spoke of three periods in medical science, each definitely stamped with its own characteristics. The first, he said, was from 1870 to 1900, and was one of sanitary reform. The next period was marked by growing concern for the protection of the individual, which had been the basis of recent legislation, as evidenced by maternity and child welfare and the treatment of tuberculosis and the National Health Insurance scheme.

"We now stand," the Prince of Wales continued, "in the early days of an era of preventive medicine, in which the progress made in sanitation and care of the individual will be developed, and fresh research will lead to the solution of problems not yet solved, and to the prevention of much ill-health. The establishment of this school is of special importance to the British Empire, and it has undertaken great responsibilities. In my travels I have discovered at first hand the appalling loss of life and effort due to tropical diseases; and I have realized how great is the need for research in tropical medicine and hygiene. In the cause of hygiene generally the school will help and develop the growing work that has already been done. For these reasons I believe that the establishment of

this school provides a great opportunity for this country and for the whole world."

In 1921 a committee, under the presidency of Lord Athlone, appointed by the Minister of Health (now Lord Melchett), finding that the teaching of public health in London was inadequate, recommended the establishment of a central institution, affiliated to the University of London, in which full provision should be made for the teaching of all branches of preventive medicine. This recommendation could not have been carried out without the generous help of the Trustees of the Rockefeller

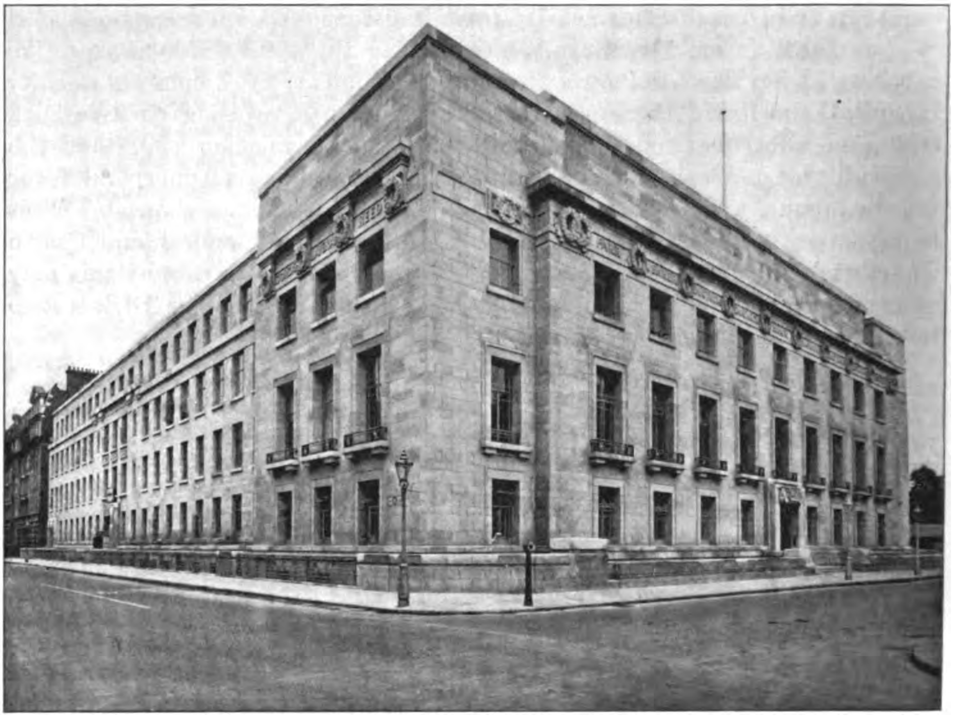


FIG. 1.—The new building of the London School of Hygiene and Tropical Medicine—the gift of the Rockefeller Foundation. Architects: Mr. P. Morley Horder and Mr. Verner O. Rees, A.R.I.B.A.

Foundation in New York, who, recognizing the advantages of London for studying well nigh every type of hygienic problem, offered the Ministry of Health £460,000 to be expended on the purchase of a site, and on the building and equipment of an institution of the type required. The only condition was that the British Government should contribute adequately towards the maintenance. The trustees hoped that the school, while serving national and imperial needs, would become a centre of world-wide influence in the training of public health students and in the furthering of research into public health problems. In 1899 Mr. Joseph Chamberlain, the

Colonial Secretary, founded a school for the study of tropical diseases. This, the London School of Tropical Medicine, was under the control of the Seamen's Hospital Society, and had its home first in premises at the Albert Docks, and after the war at Endsleigh Gardens. In 1924, by Royal Charter, the London School of Tropical Medicine and the New School of Hygiene were incorporated. This union was timely, as later work has gone to show that there are very few diseases peculiar to the tropics, and of these only one or two are of importance. The principles which govern hygiene in the tropics are identical with those followed in temperate regions. It is only the application of them which differs from the practice in Europe and requires special study.

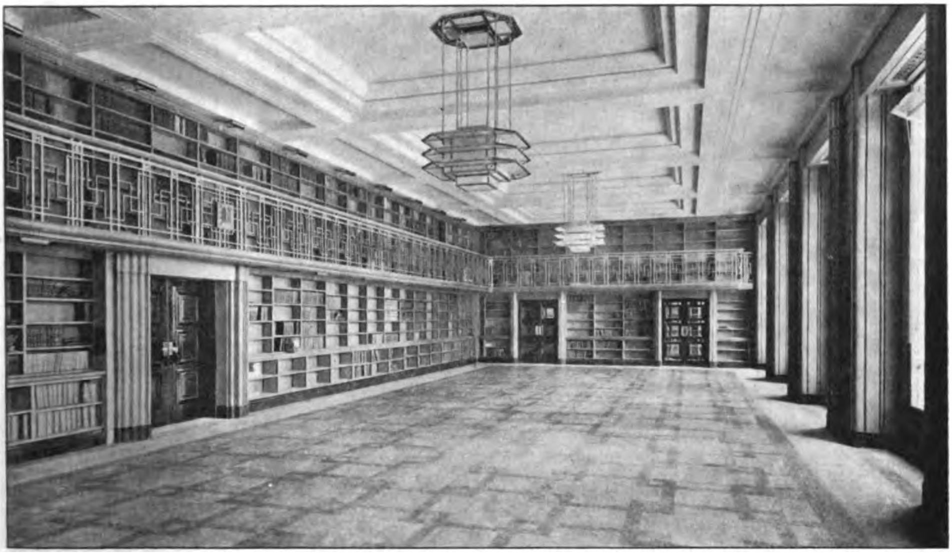


FIG. 2.—The Library.

The school, charged with so many duties, required to be housed in a building specially designed, and, after much careful consideration, the designs submitted by Mr. P. Morley Horder were accepted. The building is of modern type (fig. 1) varying from five to six stories in height. The block plan is in the form of a hollow rectangle, with a central transverse section, permitting of north and south courts, and dividing the structure into two main divisions. One of the divisions comprises all the rooms required for public use, such as the museum, library and lecture theatre, and the other accommodating the teaching and research departments, including large laboratories, taking as many as eighty students, also small laboratories, workshops and animal rooms.

The external façades are of Portland stone. Around the façade of the front block runs a frieze bearing the names of pioneers in tropical medicine

and hygiene, including that of our late chief, Sir William Leishman. The flooring of the administrative and public rooms is made of cork, and that of the laboratories with teak blocks. Heating is by means of pipes embedded in the ceiling, instead of by the usual radiators. Generous window space has been provided, 1 ft. to 5 sq. ft. of floor area, and in the laboratories 1 ft. to 3 sq. ft. of floor area.

Particular attention has been paid to the library and museum. The library is large, and all the various sides of the work are represented. The museum consists of three parts, viz., sanitary engineering, hygiene in the general sense, and tropical medicine. A number of leading firms have

FIG. 3.—One of the large laboratories.

presented exhibits of great educational value. The museum is open to the public and cannot fail to have an influence in improving the health of the people both at home and abroad.

The School has the following Divisions:—

(1) *Public Health.*—This term includes not only environmental hygiene and the control of infectious diseases, but also all that relates to the health and welfare of the individual. There is also a section devoted to the physiology of hygiene, and in this direction the activities of the division will be brought into contact with industrial problems and should play a notable part in assisting both the employer of labour and the employed. Professor W. W. Jameson is in charge of this division, and the assistant director is Lieut.-Colonel G. S. Parkinson, at one time assistant Professor

of Hygiene at the Royal Army Medical College. The lecturer in Tropical Hygiene is Lieut.-Colonel G. E. F. Stammers, late R.A.M.C.

(2) *Epidemiology and Vital Statistics.*—This department is in charge of Dr. Major Greenwood.

(3) *Bacteriology and Immunology.*—This is a most important department, and is in charge of Professor W. W. C. Topley.

(4) *Biochemistry,* including a Department of Chemistry as applied to Hygiene. Many of the most important problems in preventive medicine require for their solution the help of the biochemist, and the work in this

FIG. 4.—A corner of the Museum.

department will be mainly of a research nature. The Department of Chemistry will train the student in the methods employed for the analysis of water, sewage, foods, disinfectants, etc.

Dr. Harold Raistrick is in charge of the Biochemistry, and Professor M. E. Delafield has charge of chemistry applied to Hygiene.

(5) *Medical Zoology.*—This includes the departments of protozoology, helminthology and entomology. An aquarium and insectarium are features in the equipment of this division. Professor R. T. Leiper is in charge of the division, and Miss Joyce Leishman is the demonstrator in zoology.

(6) *Tropical Medicine and Tropical Hygiene.*—This embraces the

clinical work in diseases of the tropics, for which facilities are afforded by the Hospital for Tropical Diseases, Endsleigh Gardens, which, under the auspices of the Seamen's Hospital Society, will continue in close touch with the school. Dr. Andrew Balfour is the director, and Lieut.-Colonel Stammers the lecturer in tropical hygiene. There are also many distinguished visiting lecturers.

The school also possesses an entomological field station at Farnham Royal, and, thanks to the Ministry of Agriculture, an institute of agricultural parasitology at St. Albans. On the tropical side it co-operates with the Government of Southern Rhodesia in the work of a field station at Salisbury, and frequently sends members of its staff abroad for purposes of study and research.

We hope that adequate funds will be forthcoming for the maintenance of this school, and that it will attain its great object—the "Welfare of Mankind."

Clinical and other Notes.

AN UNUSUAL CASE OF PNEUMOTHORAX.

By Major W. BLIGH O.B.E.
Royal Army Medical Corps.

A Territorial soldier, while on duty at his annual training camp, was in the act of mounting his horse when the animal dealt him a severe blow with its head over his left lower ribs.

He was sent up to hospital as a case of possible fracture of a rib, but on examination, both physical and by X-ray, no signs of fracture or hæmothorax or of any other injury to the left chest were evident, and beyond some tenderness and pain over the sixth and seventh left ribs just outside the nipple line, the man appeared perfectly healthy and comfortable.

On the morning after admission, at about 5.30 a.m., the patient got out of bed to pass urine, and was at once seized with urgent dyspnœa, blueness of face and extremities, and collapsed.

He was got back to bed and given some brandy by the sister in charge of the ward and the very urgent symptoms soon improved.

When seen some thirty minutes later, he was found to have the cardinal symptoms of a complete pneumothorax on the *right* side. With absolute rest, aided by simple treatment, his recovery was uneventful, the pneumothorax steadily absorbed, and in from twenty-one to twenty-four days the physical signs in the right chest were normal. During his convalescence he had a slight amount of sputum, but no tubercle bacilli were found in it.

Now the police authorities on the other side of the Channel conceive it to be their duty to reconstitute crimes committed against the body social, and it sometimes falls to our lot to try and reconstitute crimes against the body corporal.

In other words, we have to advance some reasonable explanation as to how a blow on the left chest could produce a pneumothorax in the right side, occurring, moreover, some twenty hours later.

Now, no conceivable force applied to the left side could rupture a perfectly mobile and healthy lung on the right side without gravely injuring the chest wall, so I think that we must start with a postulate. Euclid demanded several, but we will be content with one, and that is that somewhere in the right chest there was a slight patch of adhesion between the visceral and parietal pleuræ.

Nor is our postulate a great thing to ask for; the pathologists are constantly reminding us that they hardly ever open an adult chest without finding some evidence of old tuberculous disease in the shape of scarring at

one or other apex, and some adhesion between the visceral and parietal pleuræ; evidence of some ancient and forgotten pleurisy is common enough. Let us now picture our Territorial standing beside his horse and facing, as is right and proper, the tail end of the animal; he lifts his left foot to place it in the stirrup, closes his glottis to make the effort of mounting, and at that moment the animal's head, a blunt heavy instrument (such as the medical jurists delight in when giving evidence in the courts), strikes him violently on the left chest.

The glottis being closed, all the mechanical requirements are fulfilled for the passage of the lines of force across the left chest through the mediastinum to produce a sudden and violent compression of the right lung.

Now our postulate gets to work, and it is easy to imagine this transmitted force to be sufficient to cause a slight tear in the visceral pleura where, owing to the adhesion, it is unable to slide over the parietes.

But my readers will ask, Why no pneumothorax till twenty hours later?

Here we are helped by our early efforts at mending punctures in tyres, when we found to our disgust that though the slit in the tyre appeared to be efficiently closed, yet a little extra mechanical strain caused the patch to yield and the puncture to recur.

We can therefore, I think, easily picture the slit in the visceral pleura still closed by the adherence between the two pleurae, but so lightly and weakly that a little extra strain would cause the patch to give.

Then, again, we have twenty hours of silent and unnoted work on the part of the traumatic inflammation set up by the tear still further weakening the already inefficient patch, and in the early morning the man closes his glottis to make the effort of getting out of bed (no slight effort to a weary soldier, as we all find), the patch gives way, air rushes into the pleural cavity and the catastrophe arrives at its final consummation.

I trust that the above "reconstitution" will hold water, if not air; at any rate it has the virtue of coming straight from the horse's head, if not directly from its mouth.

TRAUMATIC ANEURYSM OF THE HEART.

By Major R. PRIEST,
Royal Army Medical Corps.

On March 31, 1927, Private C., aged 21, while serving in India received an accidental wound by a 0·22 bullet which passed through the upper right arm and entered the chest wall in the region of the fifth rib in the posterior axillary line.

Prior to this he had always been a healthy and active soldier. After receiving the wound he fainted and was admitted to hospital, where he

complained of pain in the chest and exhibited some hæmoptysis. After about nine days all signs and symptoms disappeared and he appeared to have made a good recovery, but two months later he was admitted to hospital for paroxysms of cough, and on examination he was found to be anæmic and his liver was enlarged. There was also ascites and œdema of the legs. Examination of the heart showed some enlargement and a systolic murmur was heard at the apex.

He was transferred to England and reached the Queen Alexandra Military Hospital, Millbank, on November 15, 1927. On admission he showed generalized anasarca, much free fluid in the peritoneal cavity, fluid at the bases of the lungs with paroxysmal cough and dyspnœa. He was much relieved by paracentesis abdominis.

Clinical examination of the heart showed much enlargement transversely to the right and left of the sternum. There was no thrill and no diastolic shock. On auscultation at the apex systolic and diastolic bruits were heard all over the precordium and the diastolic bruit could be traced from the aortic area, down the left border of the sternum to the apex. In addition to these bruits, which were constantly present, there were inconstant and more superficial murmurs which were not quite synchronous with the heart's systole and diastole, heard best at the base, suggestive of a superadded pericarditis. Other concomitant clinical signs of aortic incompetence, such as collapsing pulse, capillary and retinal pulsation, were noted. There was no history of rheumatism or of other previous illness which would ordinarily account for a condition of endocarditis, and there were no clinical or pathological evidences of such.

After paracentesis, the liver was found to be much enlarged and exhibited expansile systolic pulsation. The clinical picture was therefore that of chronic cardiac failure.

The urine showed occasional traces of albumin, but no casts and no red blood-cells were seen in the deposit at any time; the quantity passed varied greatly from 34 to 120 ounces daily.

The blood examination showed hæmoglobin 64 per cent, red blood-cells 4,800,000, leucocytes 12,500, polymorphs 80 per cent, small lymphocytes 4 per cent, large lymphocytes 8 per cent, eosinophiles 1 per cent, transitionals 7 per cent. The Wassermann reaction was negative.

An X-ray examination showed the presence of a bullet lying near the heart and appearing to move during respiration.

The ascitic fluid was non-inflammatory. The central nervous system appeared normal and the optic discs unaffected. The temperature throughout was normal except for an occasional moderate rise.

During the subsequent course of persistent progressive heart failure it was noted that the systolic and diastolic bruits gradually assumed the character and regularity of a machine, and strongly suggested the presence of some unusual intercommunication between the left and right side of the

heart. Also the more superficial pericardial friction sounds became much less constant.

As regards diagnosis, after eliminating infective endocarditis and other causes of heart failure, the opinion arrived at was that the heart had been damaged in such a manner as to cause an arteriovenous intercommunication, the site of which could not be ascertained during life.

In spite of all dieting, the administration of many cardiac stimulants, cathartics and frequent paracentesis abdominis, the heart muscle finally gave out and the patient succumbed on April 23, 1928, thirteen months after receipt of the bullet wound.

Major W. R. O'Farrell, R.A.M.C., performed the autopsy and found that the pericardium was adherent all over the surface of the heart, particularly at the base. The heart itself was very much enlarged. The right auricle was greatly dilated and the tricuspid opening admitted five fingers. A communicating channel was found leading from the right auricular wall into the aorta, the opening being situated just above the cusp of one of the semilunar valves. The channel was not of uniform calibre, but a distinct sac was present between the auricular wall and the opening into the aorta, the lesion being of the nature of a varicose aneurysm. No wound of entry into or exit from the heart could be found, this being obscured by the resultant adherent and thickened pericardium. The bullet, a small one about the size of a 0·22 bore, was firmly encapsuled in dense fibrous tissue situated in the lung substance at the root of the lower left bronchus. The other post-mortem findings were those of chronic cardiac failure. Conclusion drawn from post-mortem: A gradual development of chronic mediastino-pericarditis and an aneurysmal connection between the aorta and the right auricle, through which parts the bullet must have passed before coming to rest in the left lung, close to the bifurcation of the bronchi.

The interesting features of the case are the comparative lack of symptoms of cardiac damage immediately after the injury, and entire absence of symptoms thereafter for nearly two months.

The track of the bullet was probably not at first sufficiently patent to allow of much intercommunication between the aorta and the right auricle, but as time progressed the channel became more and more open and direct, thereby throwing gradually increasing work upon the heart to maintain efficient circulation.

I should like to express my thanks to Major W. R. O'Farrell, R.A.M.C., for making the post-mortem examination and the report thereon.

Echoes of the Past.

THE MEDICAL DEPARTMENT IN THE CRIMEA.

By Lieutenant-Colonel G. A. KEMPTHORNE, D.S.O.
Royal Army Medical Corps.

(*Continued from p.* 67.)

On October 25 the Russian army operating outside Sebastopol attacked Balaklava in force, and drove the Turks from the line of redoubts which formed the outer defences. Their further advance was held up by the Highland Brigade under Colin Campbell, which was responsible for the defence of the town, but we had to draw in our line of defence. The most dramatic incidents of the battle were the charges made by the Heavy and Light Cavalry Brigades. For his gallantry in attending a wounded officer during the last episode, Surgeon J. Mouat, of the 6th Dragoons, later received the Victoria Cross.[1] The wounded, 236 in number, were brought in without incident. The threat on the town caused Lord Raglan great uneasiness. A change of the advanced base was for some time under consideration. All medical stores had to be packed up and sent on board ship, and all sick were ordered to be despatched to Scutari. The last imposed a reversal of the policy on which the organization of the Medical Department was based, namely, the retention of the majority of the casualties of the Army as near the front as possible.

The progress of affairs at Scutari, which were already creating considerable excitement at home, now requires some consideration.

We may presume that the organization of the Medical Department for the expected campaign had been based on the principles pursued by Sir James McGrigor in the latter half of the Peninsular War. Each regiment had the care of its own sick when in camp and quarters. When the Army was on the move the sick of each brigade were left for the time being in charge of an assistant surgeon with a proportion of N.C.O.'s and men as sick attendants. This was sometimes called *Brigade Hospital.* If the numbers were considerable, and in any case at intervals of forty miles or so, a *General Hospital* was formed. Sick attendants were detailed as before, and a captain as commandant. The Inspector-General arranged for hospital bedding and clothing from the purveyor's stores carried with the Army, or from the nearest depot, a deputy purveyor, an apothecary, and a medical staff. These hospitals did not as a rule exceed 300 beds, though circumstances might lead to their expansion, especially after heavy fighting. The staff then had to be supplemented from regimental sources.

[1] The Victoria Cross was instituted February, 1856.

They were regarded rather as dumps for the sick than as centres where special facilities for treatment were available. During the early part of the campaign immense hospital establishments had indeed grown up at Lisbon and Coimbra, but base hospitals were regarded by McGrigor as necessary evils destructive alike of the strength and discipline of the fighting forces, and he did all he could to retain casualties as near the front as possible. Considering the agonies endured by the wounded during their transit over country roads in the returning supply wagons, this proceeding was, incidentally, also the most humane.

But every war produces fresh problems. Starting with the idea of land operations in Bulgaria, the Army was suddenly called on to carry out the invasion of the Crimea, where, as on Gallipoli in later times, circumstances compelled the evacuation of the majority of the casualties by sea, and their treatment in base hospitals 300 miles away. For this we were not prepared, nor was the existing organization sufficiently elastic to meet the case.

While the regimental hospitals were adequately provided for, the equipment likely to be needed for general hospitals was estimated for in bulk by the Director-General. It was embarked in various ships mixed up with other military stores. Some of it was landed at one place, some at another. Some even went backwards and forwards several times and was never unpacked. A similar fate befell the corpse of an Irish officer which had been sent home for burial.

The personnel, when the order to open general hospitals was given, had to be completed from that available at the front. Stewards, wardmasters, orderlies, and cooks were obtained from the regiments. Two of the essential ranks, those of purveyor and apothecary, had almost disappeared from the Army List. None had been appointed to them since 1830. The purveyor, who was responsible for the entire domestic economy of the hospitals, was at first represented at Scutari by a Peninsular dug-out over seventy years old. There was an apothecary in charge of the base medical stores, but, until a warrant authorizing the employment of a number of chemists' assistants with the relative rank of lieutenant appeared late in October, the assistant surgeons had to dispense their own prescriptions. The only regulations available were contained in a small pamphlet drawn up for the management of a thirty-bedded hospital in peace time.

It will be seen, therefore, that the base hospital had to be created after the Army had arrived at the seat of war, a task now rendered all the more difficult by the fact that there was no co-ordination of the different services on which the P.M.O. had to draw, and no one competent to exercise pressure or take financial responsibility. After the troops left Constantinople a regimental major became base commandant.

On the eve of the battle of the Alma the Turkish General Hospital of 968 beds was in full working order under Dr. Menzies, being properly equipped according to the recognized method. We have Miss Nightingale's testimony to its good management. But to provide for the expected

casualties many more beds were needed, and, in accordance with the scheme prepared by the Inspector-General, a portion of the great Turkish barrack overlooking the sea of Marmora was taken over. It was quadrangular in shape, each side about a quarter of a mile long, and about half a mile from the General Hospital. Despite medical representations, the work of rendering it fit for occupation was much in arrear. It was in a filthy condition, and the drains, connecting with cesspits beneath the building, were untrapped. To add to the trouble, much of the equipment needed could not be drawn. It had been sent on to Varna, and was not returned for some weeks.

This hospital was rapidly filled up with patients suffering from septic wounds, cholera, and dysentery, landed in the clothes they had worn since the opening of the campaign. Many of them were verminous, and neither baths nor change of clothing were available. The aspect of such a convoy, inevitably a distressing one, may, in the absence of organized arrangements for disembarkation, transport to hospital, and prompt disposal on arrival, become a horror. During the rush the wards were visited by Dr. Russell, the *Times* correspondent, and various other well-meaning but indiscriminating critics. Russell wrote about the terrible neglect of our wounded and the "disgraceful antithesis" between the treatment of our men and the careful nursing of the French. "There is not the least attention paid to decency or cleanliness, the stench is appalling, and, for all I can observe, the men die without the least effort to save them." It need hardly be said that the outrageous suggestion contained in the last charge was very soon recognized to be unjustified. It was in fact conceded, after several of the doctors had paid for their devotion with their lives, that their conduct under the circumstances in which they were placed was, from a professional point of view, meritorious, and even heroic. But the policy of the *Times* for the moment was to abuse all those who held commissions in Lord Raglan's command as lazy stupid, and incompetent. The same sort of charge was made years afterwards at one period of the South African War.

There seems no reason to doubt that the lessons learnt during the first days were applied as far as resources would permit. The Inspector-General who spent the middle of October at Scutari, told the Commander-in-Chief on his return that the hospitals were "as good as could be expected," a report more than confirmed by the veteran general, Sir George Browne, who went down wounded in November and made what he described as a minute inspection. In December a new military hospital was opened in the cavalry barracks at Kulali, four miles up the Bosphorus; another was formed in the palace of Haidar Pasha, about a mile from the Sea of Marmora, not far from the General Hospital. This was designed to take 400, and at the same time new wards were added to the Barrack Hospital. Unfortunately this expansion, bringing the beds available in base hospitals up to about twelve per cent of the force, was quite insufficient to provide

for the increasing number of sick sent down in January and February.[1] The numbers evacuated home were insignificant until March, when transport was made available and 1,120 were sent away. There is no doubt that the complaints of overcrowding were fully justified.

In an army where even fighting efficiency had been sacrificed to economy, the provision made for the comfort of the soldier, whether in health or sickness, could only be of the most meagre description. Officers and men had been brought up to accept the fact, especially in war, with what Kinglake calls "that silent, that soldierly fortitude which disdains the recourse of complaint." It is not surprising, therefore, that the older medical officers had a low ideal of the amenities which should be provided in a hospital. An engraving of a ward in the Barrack Hospital made at this time shows two rows of trestle beds, raised about six inches above the floor, and eighteen inches apart (there are said to have been four miles of them), no other visible trace of furniture, but in one corner a pile of mops and a pail. Even tables for operations were difficult to find. All surgery was performed in the ward in full view of the other patients.

Though the military might regard such arrangements as the best that could be expected, civilian critics were far from satisfied. A committee was sent out, followed by a sanitary commission and various civilian experts. The P.M.O., Dr. Menzies, overwhelmed with clerical work as well as the surgery of his own hospital, seems to have lacked imagination. His sense of discipline and respect for Army tradition forbade him either to seek for assistance through other than the official channels, or even to acknowledge to an outsider that he had any needs at all. Neither he nor his superior officers grasped the fact until it was too late, and the initiative had passed to other hands, that the public, who for the past forty years had remained indifferent as to how their soldiers lived and died, was now, in a wild outburst of belated generosity, clamouring to provide the sick and wounded with all the paraphernalia of an up-to-date civil hospital.

Before condemning him for lack of boldness and initiative under circumstances with which no medical chief of his generation had ever been confronted, it is necessary to remember how little influence seniority in the medical service then carried with it, and how anomalous the position of the medical staff. Without power of command over anybody, they held much the position of camp followers. Even the customary compliments associated with a military funeral were denied to the staff surgeon. When an alleged breakdown occurred in the medical arrangements on board one of the transports, Lord Raglan, after a court of inquiry on which the medical

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[1] The Sanitary Commissioners estimated the proper capacity of the hospitals, on their arrival, as follows: Barrack Hospital 1,800, General Hospital 899, Palace Hospital 467, Kulali 949. Total, 4,115. During the spring the Civil Hospital at Smyrna was opened, and 400 more beds were provided at Abydos. A second Civil Hospital was afterwards formed at Renkioi, 10 miles from Abydos on the Dardanelles.

service were unrepresented, did not hesitate to include the name of his own Inspector-General with that of the officer directly concerned in a censure published in General Orders. As we have seen, the commanding officer to whom Deputy-Inspector Menzies was immediately responsible was a regimental major. Dr. Hall, who was in personal touch with the Commander-in-Chief, was too far away to attempt to influence the situation. Eventually the administration of the hospital base was practically controlled from home, and was assumed as a special care by Sidney Herbert, one of the Cabinet, on behalf of the Government. In carrying out his task he relied largely for his information and advice on a special agent of his own selection.

Miss Nightingale was already known in the medical world as a lady of independent means and original ideas, who had made a special study of the management of institutions for the care of the sick. Her appointment by Sidney Herbert, however, as "Superintendent of female nurses in the hospitals in the East," was due also to the fact that she was a personal friend of his. She arrived at Scutari on November 4, accompanied by 8 Anglican and 10 Roman Catholic Sisters of Mercy, 6 St. John's Sisters, and 14 hospital nurses. She brought with her a quantity of stores, and had the disposal of a considerable sum of money provided by private subscription. In addition, the commissioner of the fund raised by the *Times* placed his resources freely at her service. She thus became not only matron-in-chief, but the virtual organizer and distributor of all voluntary aid. Sidney Herbert had asked her to "go out and reorganize the whole thing," a request she interpreted literally, corresponding direct with him and with Lord Raglan on every subject directly or remotely affecting the service of the hospitals. Even the conduct of the medical officers seems to have been dealt with in these letters.

Of the nurses, ten were sent to the General Hospital and twenty-eight to the Barrack Hospital, which Miss Nightingale made her own headquarters. Whatever the ultimate result, and the beneficial and far-reaching influence exercised on the future, the presence of these ladies could have had very little immediate effect on the nursing efficiency of the hospitals. They were few in number, and a proportion of them were as yet untrained. The number admitted to each division depended on the officer in charge, and their services were employed rather in the nursing of special cases than in the general supervision of the nursing of the orderlies. The Lady-in-Chief ruled them with an iron discipline; those who proved inefficient were sent home. They were all sent to bed at nine o'clock. They were forbidden to nurse officers. Their uniform included a grey twisted wrapper, a white cap of a pattern which nearly caused a mutiny, a short woollen cloak, and a frightful scarf of brown holland embroidered in red "Scutari

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[1] On December 29, she wrote to Lord Raglan of "the zeal, vigour and assiduity" of Dr. Macgregor, the M.O. in charge of the Barrack Hospital.

Hospitals." Hearing that forty-six more nurses were on their way in December under Miss Stanley, the sister of the Dean of Westminster, she protested strongly. She wrote home on the 15th: "I have toiled my way into the confidence of the medical men. I have, by incessant vigilance day and night, introduced something like system into the disorderly operations of these women, and the plan may be said to have succeeded in some measure as it stands. . . . But to have women scampering about the wards of a military hospital all day long, which they would do, did an increased number relax the discipline and increase their leisure, would be as improper as absurd."[1] She found employment for them, nevertheless. Some went to the new hospital at Kulali, where Miss Stanley became lady superintendent, and others were sent to the general hospital at Balaklava. By the end of the war the full complement had risen to 125.

But Miss Nightingale's most important achievement in the early days was in helping to set in order the domestic arrangements of the hospitals, which belonged properly to the department of the purveyor, an officer in a much more independent position than our present quartermaster. The cooking was of the simple military type, being performed in thirteen large coppers. The dinners took three hours to serve. She obtained a number of American stoves, and had all the extras cooked by her own cooks. Any extras ordered by the M.O.'s, which could not be provided by the purveyor, she supplied from her own stores. These extra diet kitchens seem eventually to have been established in all the hospitals in the East. Somewhat later M. Soyer, the chef of the Reform Club, when he came out to the war spent much time in teaching the hospital cooks how to make palatable dishes out of Government rations. His stove is still with us.

The washing contract made by the Purveyor-in-Chief had broken down. During the month of October only five shirts had been returned to the Barrack Hospital. Miss Nightingale started a laundry in which she employed the soldiers' wives, many of whom remained at Scutari. She distributed clothing on a vast scale. The sick, who it had been officially assumed, would bring a spare shirt to hospital, had not done so, as their valises had not been landed with them. She claimed before the arrival of the necessary stores to have issued 50,000.

The medical staff at Scutari on the last day of the year consisted of 5 surgeons first class, 9 surgeons second class, 47 assistant surgeons, and 3 civilians. As time went on the proportion of civilians was increased. The Director General employed at different periods of the war both temporary commissioned officers and civil surgeons.[2] When the question of the initial grant of superior rank to the more experienced surgeons who

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[1] E. Cook, "Life of Florence Nightingale."

[2] The Army List of 1856 shows 156 acting assistant surgeons. The surgeons and assistant surgeons with regular commission, excluding regimental ones, then in the East, amounted to 107.

offered their services arose, the refusal of Dr. Smith to put them above the regulars was made a pretext for the establishment of civil hospitals at Smyrna and Renkioi, independent of all military control. They were wrongly sited, enormously expensive, and it was eventually conceded that the principle was a vicious one. Miss Nightingale's relations with the senior officers seem on the whole to have been happy. She was rather hard on the juniors. Writing soon after her arrival she says: "We are lucky in our medical heads. Two of them are brutes and four are angels, for this is a work which makes either angels or devils of men and of women too. As for the assistants, they are all cubs, and will, while a man is breathing his last breath under the knife, lament the annoyance of being called up from their dinners by such a great influx of wounded. But unlicked cubs grow up into good old bears, though I don't know how, for certain it is the old bears are good."[1]

Late in November, and somewhat late in the day, Lord Raglan sent a general officer, Lord William Paulet, to command the hospital base. Dr. Menzies remained there as P.M.O. till January 3, when his health entirely broke down and he was invalided home. His place was taken by Dr. Alexander Cumming, a member of the hospital commission which had recently visited Scutari, who became Inspector-General.

Under their administration, and with the ample resources now placed at their disposal, continuous progress was made till, by the spring, a high degree of efficiency had been attained. But the bad start made under official auspices was never forgotten. Miss Nightingale's name was now a household word, and she was popularly regarded as the source and inspiration of everything that was accomplished. Certainly that talented and indefatigable lady had a finger in every pie.

The mortality in these hospitals during the winter was enormous. In December it was 17 per cent, in January 32 per cent, in February it rose to 42 per cent. After this, when the epidemic of typhoid, to which the deaths were latterly due, had worn itself out, the death-rate steadily declined. Overcrowding was undoubtedly responsible for much, as numbers of cases of cholera and continued fever originated and reached epidemic form in the wards themselves. Cholera and diseases of the bowels accounted for about three-quarters of the deaths from sickness during the war. Whether other alleged insanitary conditions in the patients' surroundings played the important part claimed is more than doubtful. The Sanitary Commission which commenced work in February took great credit for the subsequent improvement in health which took place. So far as the hospitals were concerned, Sir John Hall always stoutly maintained that there was nothing left for them to do.

In spite of repeated medical recommendations, it was several weeks before a proper system of sick transport was established between Balaklava

[1] E. Cook. "Life of Florence Nightingale."

and Scutari. The patients were embarked on whatever ships were available at the moment, and at the shortest notice. As a result there were constant complaints of failure to provide the necessary stores and attendants. Sailing was sometimes delayed after the sick were on board, and the voyage of 300 miles was rarely completed under a week. Numbers of deaths occurred on board, and, when abuse of everything medical had become the fashion, some did not hesitate to ascribe these to want of proper attention on the passage. According to figures furnished by Miss Nightingale, 2,902 patients were put on board at Balaklava in January. Of these 262 were buried at sea, and 847 at Scutari subsequently.

The real misfortune was that, for the first three months, not only was there no shelter available in the Crimea for serious cases, other than about 300 beds in the General Hospital, but, owing to the Russian threats on Balaklava, Lord Raglan strongly discouraged the retention of casualties at all. As a result entirely unsuitable cases were embarked. With the extension of hospital accommodation at the front, the number of deaths in transit became infinitesimal and the mortality of the wounded dropped from 17·5 per cent to 13·7 per cent.

The numerous small details concerned in the welfare and comfort of the sick during the process of evacuation can only be learnt by experience, to which professional knowledge is a valuable asset. But the duties of the medical officers in the sick convoys were confined almost entirely to the doctoring of the patients and the issue of medical comforts. Otherwise they had little to say in the matter. Both at Balaklava and Scutari small boats were usually needed in embarking and disembarking. The landing places were unsatisfactory in bad weather, and there was no shelter on the quays. Transport to hospital was badly organized; serious cases had on occasions to be carried a mile and a half on uncovered stretchers, others had to walk. On arrival at the hospital there was at first no large reception room where patients could be checked, classified, and disposed of, and no facilities for bathing them before they were put to bed. It was alleged that deaths occurred from exposure, that patients handed over to the Turkish recruits, who acted as guides, were found wandering about in the rain, that stretcher cases were dumped in corridors and forgotten, even that one was found next morning dead in the street. All this was rectified in due course, but not without much unnecessary discomfort to the patients, and considerable scandal at home, where matters were represented as even worse than was actually the case.

To return to the Crimea. The fine weather continued up to the end of October, and only 567 patients were transferred to the base hospitals. At dawn on November 5 the right of our position on the Inkerman ridge was strongly attacked. For the first three hours we had about 4,000 men opposed to 40,000 Russians. After eight hours desperate fighting in a fog, during which generalship was entirely absent, the enemy was repulsed with loss, our casualties being 632 killed and 1,878 wounded, representing about

32 per cent of the troops engaged. The regimental hospitals performed the rôle of main dressing stations, the wounded, who were all in by nightfall, being cleared to the ships as soon as opportunity offered. For this purpose the twelve heavy ambulances were employed, supplemented by a number of mules with cacolets lent by the French. Wounded officers seem to have been received into their own tents, where they were treated until evacuated.

On this occasion the Inspector-General and all the divisional surgeons were mentioned in Lord Raglan's despatch. Dr. Wilson, 7th Hussars, who was serving on the medical staff of the 1st Division, distinguished himself by rallying a party of men and leading them to the support of an isolated detachment of the Guards, for which the Duke of Cambridge, who was in the rescued party, thanked him in front of his regiment. Assistant surgeon J. Scot, of the 57th, was also mentioned in despatches for his gallant behaviour. The mortality among the wounded at this time was 18 per cent. Hospital gangrene developed among several cases transferred to Scutari.

In November gales set in. The conditions under which the Army lived in their leaking tents were most miserable. Owing to the break-up of the road wheeled transport became impossible, and no men could be spared from the trenches to mend it. Transport animals died from hunger and exposure, rations and medical comforts had to be brought up by hand, the sick could not be sent down. Complaints arose of shortage of medicines. The ship which was bringing a fresh supply was sunk in a storm. To add to Lord Raglan's anxiéties, the Government, which was in danger owing to the revelations of the lack of provision made for the expeditionary force, showed a disposition to seek for scapegoats among the staff in the field. Dr. Hall, as head of his department, had to bear his full share of abuse. This he seems to have done with considerable fortitude, the more so, no doubt, because he was supported by his chief in London. An untiring and methodical worker, an adept at routine, he was never off duty for a day while the war lasted, never lost his head, and had an answer (conclusive at any rate to himself) for every criticism made against his administration. He had no staff officer to help him. Somewhat of a martinet, he was intolerant of what he considered unjustified complaints by medical officers. When castor oil and astringents ran short he told them to collect charcoal to treat their dysentery cases with. Though he may have inspired respect, he did not arouse the enthusiasm of his officers, some of whom, possibly wrongly, thought him unsympathetic. The rising generation represented by Alexander and Thomas Longmore, whom the influence of Miss Nightingale brought to the front after the war, complained that he was a theorist, were impatient with the faith he seemed to pin on the accumulation of returns, and condemned him for want of firmness in representing their difficulties. Considering the staff he had to take his orders from, and the conditions he had to contend with, it may well be possible that he was better fitted to the post than many a more brilliant man.

After the battle of Inkerman followed a period of months during which the opposing armies were fully employed in combating sickness and the Crimean winter. Bowel diseases, including enteric, were prevalent, scurvy and frost-bite accounted for many admissions. The 21st had 46 deaths in December, 72 in January, and 87 in February. Of these 106 occurred in camp. In the latter month the regimental hospital consisted of 2 marquees, 2 huts, and 6 bell tents, with grave-yard adjoining. At this time nearly a third of the entire force was in hospital. The patients transferred to Scutari averaged about 700 a week.[1]

On January 2, Assistant Surgeon Fair of the 55th wrote: "We have 12 hospital tents quite full, each containing 12 to 15 men lying on the ground in mud or frozen to it. I have actually seen a dead body cut away from the place where the owner of it died. We sent away 23 cases this morning to Scutari by means of the French mules; snow was falling, and the wind was bitterly cold. Three died before reaching Balaklava."

In March things really began to look brighter. Labour had been obtained to mend the Balaklava road, and the newly-organized Land Transport Corps began to arrive in the country. Rations, stores, and clothing could now be brought up to the troops, and material for hutting the whole force. The new wagons and a light railway made it possible either to bring the sick down to the base, or to take medical material up to them. At the same time a proper service of sick transports between Scutari and home ports came into operation, and six steamers properly fitted for the purpose were working as sick transports in the Black Sea.

The regimental hospitals were hutted and made more comfortable, performing much the same function as our field ambulances during trench warfare in France in the last war. The accommodation at Balaklava was increased, and a second hospital was formed on the Castle heights above the harbour for 590. Later a convalescent hospital for 250 patients was opened at the Monastery of St. George, three miles from camp. During the latter part of the war the old General Hospital was used mainly as a clearing station. In April thirty-two huts were brought up in rear of the 3rd Division camp to make a camp general hospital. It held about 300 patients, and seems to have worked to some extent as an advanced operating centre. The staff at the end of the summer consisted of the divisional surgeon, Surgeon J. Mouat, in charge, two other regulars, ten civil surgeons, and a pathologist. The orderlies were supplied by the 14th and 39th regiments, which were camped alongside.

In the second week in April an intensive bombardment was opened on the town, which seems to have served but little purpose. Our gunners in the advanced batteries, who had heavy casualties, were attended by their

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[1] The admission-rate among the infantry during the period October 1—April 30 was reckoned at 1,765 per 1,000, and the death-rate 390. *Vide* Tulloch, "The Crimean Commission and the Chelsea Board."

assistant surgeons, one of whom, Assistant Surgeon Cockerell, was among the officers and men who received the thanks of the Commander-in-Chief for their valour and persistence against heavy odds.

On May 23 an expedition under Sir George Browne, composed of British and French troops, occupied Kertch without opposition and secured the command of the Sea of Azoff. Cholera broke out among the men of the 72nd on the voyage home, and the disease again became prevalent in camp. On June 18 the French and British assaulted the Malakoff and the Redan respectively. Both were unsuccessful, The regimental assistant surgeons did their duty well. H. T. Sylvester, of the 23rd, and T. E. Hale, of the 7th, were subsequently awarded the V.C.; Assistant Surgeon J. S. Phelps, who distinguished himself in bringing in the wounded, received an ensign's commission. The regimental aid posts seem to have been formed on the same principle as in modern trench warfare. The instructions laid down were that the wounded should be brought to the medical officers at some known point in the parallels "where the Engineers should construct such shelter as will protect them and the wounded from the fire of the place, and where they can perform their duties with more composure than is practicable in the open trenches." When the assault took place, the assistant surgeon of the 7th Fusiliers advanced his aid post to the most advanced trench, helped to rally the men who fell back, and remained there after the retirement to drag the wounded in under cover.

Cholera cases continued to occur; the third epidemic culminated in June. By this time the theory of the possible infectivity of the disease seems to have been gaining ground.[1] Medical officers are found somewhat diffidently suggesting the segregation of infected units. Impure water, deficient food, and bad ventilation seem to have been recognized as predisposing causes, but the generally accepted view was that it originated from a *diathesis* engendered by certain unfavourable atmospheric conditions. On June 28 Lord Raglan died, worn out by his troubles and anxieties. The immediate cause seems to have been dysentery.

On the whole the health of the troops by this time had greatly improved, and medical affairs were now running smoothly, despite of occasional letters in the newspapers criticizing the administration. These can mostly be traced to individuals anxious for notoriety, or with some personal grievance to air. Some of the complaints were due to simple ignorance. One complaint was to the effect that not a single wooden leg was kept in the advanced medical store depot now established on the heights above Sebastopol. The fact that the doctors might not always be wrong began to be recognized by the staff. An ensign who criticized the scale of medical equipment on board one of the sick transports of which he was in command was snubbed by the Quartermaster-General, and a young acting assistant

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[1] The theory was no new one, but seems not to have been generally held at the time. The contagious character of the disease was maintained by Dr. Kennedy, P.M.O., Bombay Division, during the first Afghan War.

surgeon who, after a few days' duty at the camp general hospital, wrote unfounded assertions to the papers on the maltreatment of the patients, was ordered to be dismissed the service after an impartial court of inquiry. It is of interest to note that the first action taken in the matter was by the civil surgeons attached to the hospital, who, in a reply disproving all the statements made against the regulars, stated that the military surgeons were, beyond dispute, the hardest worked, worst paid, and most meritorious body of men in the public service.

In June a new corps, the Medical Staff Corps, came into existence. Its primary object was to provide orderlies for the hospitals, for which purpose it was divided into nine companies each of seventy-eight men, a proportion of whom were graded as stewards, wardmasters, and assistant stewards and assistant wardmasters. The depot at home was put in charge of a staff captain, the only officer. The men were not subject to military law, and discipline was unsatisfactory, but at the end of the war the corps was considered to have so far justified its existence as to be retained. It was then reorganized on a military basis as the Army Hospital Corps.

A report from the Inspector-General in the Crimea, dated a year later, gives the medical personnel considered necessary for a division of 10,000 men made up of 7 infantry battalions (7,000), 3 cavalry regiments[1] (1,500), 3 batteries (720), military train (500), and commisariat and medical staff corps (280), as follows: 1 deputy inspector-general, 2 staff surgeons, 2 staff assistant surgeons, 1 staff dispenser as medical storekeeper, 11 regimental surgeons, 25 regimental assistant surgeons, 14 dispensers as N.C.O.'s. If detached, a purveyor, 2 clerks, and 2 extra assistant surgeons were required. A detached brigade had a staff surgeon first-class, 2 staff assistant surgeons, a dispenser and a purveyor's clerk, besides the regimental establishment of 3 surgeons and 6 assistants. It will be observed that the number of medical officers in the last case corresponds very nearly to those of three battalions and a field ambulance.

Trench warfare continued. In August there was a sharp action between the French and the Russians on the Tchernaya, in which the latter were repulsed with loss. On September 8, after three days' intensive bombardment, the French captured the Malakoff. We were again repulsed at the Redan. The wounded, 1,890 in number, were brought in with the help of the new ambulance wagons and the mule chairs and litters which had now been supplied in imitation of the French. During the night the enemy evacuated all the south part of the town which was now in ruins.

In October, a force of 4,000 men was sent by sea to destroy the arsenal of Kinburn at the mouth of the Dnieper. Archibald Gordon, one of the ablest of the divisional surgeons, was the P.M.O. All medical arrangements had to be made at twelve hours' notice.

The autumn and winter were uneventful. The health returns showed

[1] The cavalry in the original force was organized in a division of two brigades.

less sickness in the expeditionary force than among the troops at home. In December the hospital at Kulali was closed owing to lack of patients. In February hostilities were suspended, and Dr. Hall was given a K.C.B. The troops were all out of the country by the end of July. Their embarkation was hurried on somewhat, owing to the occurrence of fresh cholera cases.

The medical service suffered many deaths during the war on account of sickness. Surgeons F. Huthwaite, 3rd Grenadier Guards, J. O'Leary, 68th, and C. McCartney, 77th, were killed or died of wounds. The Crimean memorial at Netley records the deaths of Deputy Inspectors Thomas Spence and Alexander McGrigor, 5 First Class Staff Surgeons, 13 Surgeons, 27 Assistant Surgeons, 1 Principal Apothecary, 3 Dispensers, 2 Dressers and 2 Civil Surgeons. There were 7 deaths among the staff of the Scutari hospitals during the epidemic of February, 1855. The Select Committee on the Medical Department, which sat in the summer of 1856, recorded their high opinion of the manner the army and civil surgeons performed their duties.

Eight of the senior officers received the C.B.: David Dumbreck, the senior deputy-inspector in the Crimea, Thomas Alexander, J. R. Taylor, Archibald Gordon, William Linton, and John Forrest, divisional P.M.O.s, James Mouatt, V.C., and James Brown Gibson. The Medjidie, which was very freely bestowed, fell to several others, and fifteen received the Legion of Honour.

Sir John Hall went on half-pay on his return home, and received a good service pension in 1858. He died in Italy in 1866. Dr. Andrew Smith, who met all the criticisms made against his administration with considerable dignity and success, remained at the head of the Medical Department until 1858, when he was succeeded by Thomas Alexander, who as P.M.O. of the Light Division during the war had shown initiative and ability. Dr. Smith received the K.C.B. in 1859, and died in 1872.

Miss Nightingale, in her evidence before the Royal Commission, described the war as a complete lesson in army hygiene which we could not afford to repeat . The most important result from that point of view was an indirect one—the realization that provision for the soldiers' welfare in peace time was shamefully deficient. The reforms in barrack construction and interior economy initiated under the influence of Lord Herbert of Lea after the Crimean War have been steadily carried on ever since to the great advantage of the Service. The Royal Victoria Hospital at Netley and the Royal Herbert Hospital at Woolwich owed their origin to the same idea, The Medical Service benefited by the decision to retain and reconstitute the Medical Staff Corps, and by the establishment of the Medical School at Fort Pitt in 1859. The former, designated the Army Hospital Corps, provided sick attendants for general hospitals, and a nucleus of stretcher-bearers in war. The larger question of ambulance transport generally was not even approached for some years later.

The sufferings of the sick and wounded in the Crimea and the enormous wastage of man power were mainly due to the want of any clear scheme for the supply of the daily necessities of the fighting troops, conceived and worked out in detail in peace time, and to the successive fits of reckless economy in which even the framework of the administrative services built up by the genius of Lord Wellington in the Peninsular was allowed to disintegrate. The Medical Department, dependent on others for everything except technical skill and technical stores and appliances, suffered accordingly. The worst charge that could be sustained against the heads of the department was lack of enterprise in asserting themselves and lack of initiative, qualities which the official position then accorded them did little to foster. Some attempt was made to improve the status of the medical officers generally after the war.

It was a clear misfortune that the Inspector-General did not join the Army until it had been some weeks in the field, and that his sphere of usefulness was curtailed by the neglect of the Staff to take him into their confidence when important military movements were in prospect. That the Medical Director in London should not have been consulted on possible measures for the prevention of sick wastage during the proposed campaign, and that such measures as he did recommend on his own initiative should be practically disregarded, was all in accordance with precedent, and yet the War Ministry might have remembered one of the lessons taught by the notorious Walcheren Expedition.

We may note in conclusion that this was one of those wars in which the base and lines of communication, supposed to maintain and strengthen the field army, were allowed to become a source of weakness. Balaklava harbour became a cesspool, and epidemic disease was rife at Scutari. The general muddle which occurred at the latter was attributable largely to the fact that no steps were taken immediately it became clear that it was to become a depot for the bulk of the casualties, to despatch a general officer as commandant, invested with full powers to deal with the situation, and an inspector-general who could give up his whole time to the medical administration.

ADMISSIONS AND DEATHS, OCTOBER 1, 1854, TO APRIL 30, 1855, BASED ON TULLOCH'S "CRIMEAN COMMISSION AND THE CHELSEA BOARD."

Average strength, 28,939.

	Admitted	Died		Admitted	Died
Fevers	10,393	2,071	Scorbutic diseases ..	2,067	195
Diseases of lungs ..	3,438	365	Frost bite	1,947	428
Stomach and bowels	22,882	4,487	Wounds	4,085	649
Cholera	2,007	1,228	Other diseases	7,094	440
			Total ..	53,913	9,863

During the period 3,881 invalids were sent to England.

The death-rate for the seven months was 340 per 1,000, and the admission-rate 1,862. The death-rate for the whole war (773 days) was: for disease 87·3, and for wounds 16·8. (*Man. Mil. Hygiene*, App. 2.)

Current Literature.

i. GABY, R. E. **Electrical Burns and Electrical Shock.** *Canadian M. Ass. J.* 1927, v. 17, 1343-5.

ii. MACLACHLAN, W. **Resuscitation after Electrical Shock.** *Ibid.* 1346-50, 3 figs. [18 refs.]

i. An unusually clear and informative description of the results following electrical shock is given by Dr. Gaby. The effects depend on various factors; alternating currents do more damage than direct; low voltage is said to cause ventricular fibrillation, and high voltage paralysis of respiration; while duration of contact intensifies the effect by suspending the heart beat. The main injuries may be from burns, caused by contact with the conductor, by intense heat generated, or by the ignition of clothing. Animal tissues offer resistance to electricity in the following order: bone, fat, tendon, skin, muscles, blood and lastly nerve. Blood vessels are good conductors; hence the frequency of thrombosis remote from the site of contact. If skin resistance be low, the current may cause severe disturbances with little change at point of contact. The greater the skin resistance and duration of contact the more severe are the burns. The burns cause local necrosis due to shock; pus formation is exceptional. The severity is generally under-estimated and healing requires two or three times as long as the ordinary burn. Weakening of vessel walls may cause serious hæmorrhages at some distance from the injured site; hence operative interference may result in severe secondary hæmorrhage with a tendency to peripheral thrombosis, angiospasm and œdema. Death is held to be due to either ventricular fibrillation or paralysis of the respiratory centre. Either condition calls for artificial respiration. The cause of the suspended animation cannot be determined, hence artificial respiration should be continued as if the case were one of paralysis of the respiratory centre. With ventricular fibrillation the nerve centres deprived of blood after ten minutes cannot be resuscitated; but with respiratory paralysis the heart continues, even if feebly, and artificial respiration may be effective after two to three hours.

ii. The way in which resuscitation should be performed is well set out by W. Maclachlan. He discusses first the way in which insensibility is brought about by electric shock, pointing out how wet skin provides a good conductor; hence electrical shocks in bathrooms occur from comparatively low voltage. Where the current passes through the medulla or thorax, rather than, say from foot to foot, the effect is greatest. The nature of the profound paresis of respiration is not understood, but it may not be permanent. The block may pass, if life be maintained sufficiently long. The prone pressure method of resuscitation, as originally proposed by SCHAFER is recommended; and the method of performing it is clearly described and well illustrated (see figs. 1, 2 and 3). A rhythm of ten to the

Prone Pressure Method of Artificial Respiration.

FIG. 1. Patient and operator in correct position for beginning artificial respiration. Patient laid on belly with one arm extended and the other bent under head with face turned outwards and resting on hand or forearm so that the nose and mouth are free for breathing. The operator straddles patient's thighs, with palms of hands on small of patient's back, the fingers resting on the three lowest ribs, the little finger just touching the lowest rib.

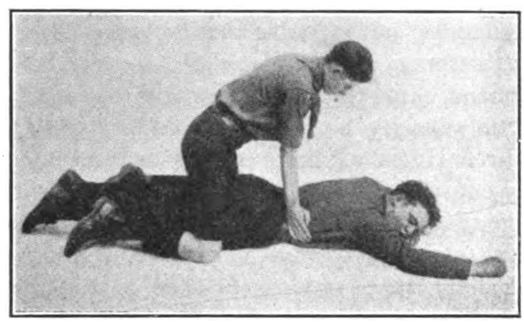

FIG. 2. The operator brings gradual pressure on the patient's three lowest ribs by swinging slowly forward until his thigh is perpendicular to the floor and his shoulders are directly over his hands, the arms being kept straight. This operation should take about two seconds.

FIG. 3. The operator then immediately removes pressure by swinging back on his knees, sitting on his heels, and allowing his arms to fall in a relaxed position of rest with hands entirely removed from patient's back. After two seconds the operator swings forward again.
[Reproduced from the *Canadian Medical Association Journal.*]

minute is recommended with the warning that, as voluntary respiration occurs, the rhythm should be modified to agree with it. Cases are on record of resuscitation after periods of three hours, during which little or no indication of life was given. "Nothing less than the cooling of the body or the onset of rigor mortis should be taken to be evidence of death." On return of voluntary breathing the patient must be kept lying down. The erect posture causes danger from the blood remaining in the large vessels of the abdomen and bringing about serious syncope. A patient must not be transported sitting up in a motor. Mr. Maclachlan expresses a hope that ere long the nature of the block caused in the nerve centres by electrical shock may be determined and a method of lessening it be introduced. E. L. Collis.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 5.

Akin, C. V. and Sherrard, G. C. **Fumigation with Cyanogen Products. Report of Experiments Conducted with Cyanogen Products Used in the Fumigation of Vessels for Quarantine Purposes at the New York Quarantine Station, Rosebank, Staten Island, N.Y.** *Pub. Health. Rep.* Wash. 1928, v. 43, 2647-70.

An account is given of experiments carried out in New York Quarantine Station between February and May, 1926, designed to test the relative merits of the various methods of fumigating with hydrogen cyanide as regards their lethal efficiency for rats, their safety to fumigators and others and their cost. The methods tested were liquid hydrogen cyanide; liquid hydrogen cyanide plus 20 per cent. cyanogen chloride as a warning gas; hydrogen cyanide generated by the barrel method; zyklon B; and calcium cyanide. Of these the barrel method can be dismissed as out of date. Calcium cyanide has several disadvantages. With the hydrocyanic acid-cyanogen chloride mixture the presence of moist materials or collections of water in the fumigated compartments appears to give rise to a persistence of HCN after all "tear effect" has disappeared. The choice therefore appears to lie between liquid hydrogen cyanide and zyklon B.

Liquid hydrogen cyanide is highly efficient, and rapidly and easily introduced by a small fumigating staff, but the storage, transport and handling of the containers present difficulties. It is considered to be the ideal fumigant for large spaces such as holds, but criticism is made in regard to over dosage of small compartments. [Since this paper was written, apparatus has been devised for delivering small and accurately measured doses to small compartments.]

Zyklon B is efficient and does not present difficulties in regard to storage, transport and handling. Interesting experiments were conducted in regard to diffusion; retention of HCN by residue; determination of minimum lethal doses, absorption by various materials and penetration. It appears that there is little tendency for HCN to diffuse from one compartment to another through small apertures when both compartments are

otherwise tightly sealed. Hence the frequency with which rats escape by taking refuge in "dead" spaces. Retention of HCN by residue is noted in the barrel method and with calcium cyanide. With zyklon B a negligible quantity of HCN remains in the residue after 2—4 hours exposure. Re-absorption of HCN by residue is noted with calcium cyanide.

In regard to the minimum lethal concentration, much less than the present standard doses of liquid HCN will kill directly exposed rats. It is therefore suggested that a reduction in the concentration employed in living accommodation would make for greater safety without interfering with deratization. [A strong concentration is frequently employed in crew's quarters and the like in order to destroy bed bugs, cockroaches, lice.] A brief exposure to high concentration is more effective than prolonged exposure to doses approaching the minimum lethal concentration, but when diffusion or circulation of the gas is difficult, length of exposure is all important. Proper aeration and drying of absorptive materials in sleeping quarters is of vital importance. When possible bedding and floor covering should be removed from crew's quarters before fumigation. A reduction of the dosage in living accommodation is worthy of consideration. [If it is not necessary to destroy bugs, etc.]

Zyklon B and liquid HCN are superior to other methods in regard to penetration, test animals being killed through 70 layers of dry sacking; 80 layers protected. With wet sacking, 40 layers protected.

Conclusion—hydrogen cyanide, if proper precautions are taken, is the best of all fumigants for rodents. The proper preparation of a vessel for fumigation is essential, and new vessels should be so constructed as not to provide "dead" spaces in which rats can escape. The combination of liquid cyanide for the holds and zyklon B for sleeping quarters and deck compartments is almost ideal. Hydrocyanic acid does not affect metals, fabrics or foodstuffs, but, since it is soluble in water, drinking water and other beverages exposed during fumigation should be poured away and bilges should be pumped dry. The final conclusion is "Fumigate fewer ships better."

[This is an excellent paper which should be studied by Port Health Officers and all others concerned with the fumigation of ships.]

CHAS. F. WHITE.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 5.

OUDARD. Les navires-hôpitaux en temps de guerre. **[Hospital Ships in War.]** *J. Méd. de Bordeaux.* 1928, v., 105, 955-60.

The work of hospital ships depends on the nature of the military operations in connexion with which they are employed. Thus immediately after disembarkation of an expeditionary force and before field hospitals can be established, it is desirable that casualties should be evacuated immediately to a hospital ship equipped to deal with every type of case.

Later, when field hospitals are established, the hospital ship will only be required to receive wounded, not as a rule requiring further operation, and convalescent sick. In the case of a retreat hospital ships may be required to take any and every type of case and perhaps civilian refugees.

The idea of a stationary hospital ship taking the place of a hospital ashore is attractive, but the enormous casualties in modern warfare make such an arrangement generally impossible, and hospital ships when fully loaded must make as rapidly as possible for a base port or a relay base.

A hospital ship for wounded is necessarily more complicated in construction and equipment than one for sick cases; consequently it is desirable to have surgical hospital ships and medical hospital ships, the latter of course being equipped for surgical emergencies.

The perfect hospital ship must be specially built for the purpose and the best type would be a motor ship with the engine-room and crew accommodation right aft. Converting cargo or passenger ships will never be absolutely satisfactory, but to reduce the disadvantages of improvisation to a minimum ships suitable for conversion should be selected in time of peace; plans of conversion should be drawn up and the equipment and personnel decided upon. Arrangements should be made with shipping and shipbuilding companies for the requisition and conversion of their vessels.

For stability, 8 to 10,000 tons gross is desirable and the average speed should be 15 knots without vibration. There should be every facility for rapid loading and unloading and every means for life saving should be provided. The equipment should be that of a hospital ashore. A surgical hospital ship of 8 to 10,000 tons would take 300 surgical cases with four complete surgical units, the operating theatres being on the upper deck amidships with an X-ray installation close by. Satisfactory surgical hospital ships cannot be improvised.

Medical hospital ships may be much larger and many passenger boats can readily be converted to the purpose.

A medical officer must be in supreme command, though he will of course consult with the captain in regard to matters affecting navigation.

Doctors and nurses must be accustomed to the sea, and there must be the closest co-operation between naval and military medical services in times of peace in order that every detail of organization may be readily worked out. Finally international law in regard to the status of hospital ships should be revised.

CHAS. F. WHITE.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 5.

Reviews.

INDEX OF DIFFERENTIAL DIAGNOSIS OF MAIN SYMPTOMS. By various writers. Edited by Herbert French, C.B.E., M.D., etc. Fourth edition. Bristol: John Wright and Sons, Ltd. London: Simpkin Marshall, Ltd. 1928. Medium 8vo., pp. xii + 1171. 701 illustrations. Price £3 3s. net.

It was in 1912 that the first edition of French's Differential Diagnosis appeared, when it scored such an immediate and pronounced success that, running through two more editions with many reprints, it has been out of print for the past five years. With the appearance of this edition, 39,000 copies have now been published, no uncertain evidence as to the position it holds in the opinion of the profession.

As stated in the preface to the first edition, the book is an index in the sense that its articles on the various symptoms are arranged in alphabetical order; at the same time it is a work on differential diagnosis in that it discusses the methods of distinguishing between the various diseases in which each individual symptom may be observed. While the body of the book thus deals with symptoms the general index at the end gathers these together under the headings of the various diseases in which they occur The guiding principle throughout has been to suppose that a particular symptom attracts special notice in a given case, and that the diagnosis has to be established by differentiating between the various diseases to which this symptom may be due.

The work has been revised throughout, but its general plan remains the same. In the revision, newer methods of diagnosis, and the results of more recent research have resulted in the alteration of many of the articles and have led to an increase in the number of pages. The illustrations now number 701, of which 179 are coloured; these latter replace the plates of former editions and nothing is lost in the change.

It is difficult adequately to express our admiration for the work, or to know which feature merits most praise. As a whole it is intensely practical; each article is evidence of sound clinical observation and knowledge, well expressed. The illustrations are excellent; apart from the coloured figures, they are mainly reproductions of photographs, and all are instructive. The radiograms are especially worthy of mention; those illustrating the newer methods of examination well repay our study.

The index of a volume seldom calls for remark, but this one is so monumental, such a tribute to the successful labour of the editor, that it cannot be overlooked. It extends to 227 pages, and contains over 90,000 references: it is compiled in such a way that not only are the references to any particular symptom found at once, but the complete description of any disease can readily be obtained by referring to the descriptions of the various symptoms gathered together under the main headings.

The publishers have done their part well in giving us a volume that is a pleasure to look at; well printed and bound in pliable covers, it is, in spite of its size not unwieldy to handle.

We must thank Dr. French for giving new life to an old friend, one which helps us in our difficulties and affords us profitable entertainment in a spare hour.

INDEX OF SYMPTOMATOLOGY. By various writers. Edited by Dr H. Letheby Tidy. Bristol: John Wright and Sons, Ltd. 1928. Pp. xii + 710. 130 illustrations. £2 2s. net.

Dr. Tidy has before this shown us that he knows what we want, and that he can supply it. Once again he earns our gratitude. Most of us have been quite content to refer to our textbooks when we have needed to refresh our memories of the symptoms of any disease we were doubtful about. When we have not had such a book, as has happened to many of us in our not infrequent periods of travel with light baggage on temporary duty, we have had to go without. Now we have in one volume descriptions of practically all the conditions in medicine, surgery, gynæcology and the special senses we are likely to meet with; just the thing we needed, although we did not realize it before.

The idea of the book is to provide an account of the symptomatology of diseases, to give a clear and reasonably full description of the clinical manifestations of each disease, without dwelling unduly on minor complications and variations. The editor, in the preface, hopes that the descriptions are such as may enable a typical or fairly typical case to be recognized by a practitioner unfamiliar with, or in doubt about, the condition concerned, and that the student can obtain a portrait of the disease, which will remain imprinted on his memory. These hopes we venture to say will be fulfilled.

There are twenty-six contributors who deal with the respective subjects in which they are recognized as authorities. The diseases belonging to each subject are described in a lucid and interesting manner, and the information given is sound and up to date. There is no undue brevity in any of the articles, although there is a noticeable absence of unnecessary matter. We have read a great deal of the book, and cannot say that any one contributor has written a better article than another; all are good.

The illustrations, four of which are coloured plates, are 130 in number, and are excellently chosen and reproduced. The indexing is exhaustive and good, with an abundance of cross-references.

We must congratulate Dr. Tidy on having edited such a volume, and on his personally supplying so many admirable articles in it. It is a volume that will soon find its way to many a bookshelf. The publishers have done their part in a befitting manner.

DISEASES OF CHILDREN. Edited by Sir Archibald E. Garrod, Dr. Frederick Batten, Dr. Hugh Thursfield and Dr. Donald Paterson. London: Edmund Arnold and Co. Second Edition. 1929. Pp. vii + 1106. Two coloured plates and 205 figs. 45s. net.

It is curious that fifteen years should be allowed to elapse from the first publication of such a volume as this to the appearance of a second edition. So much has knowledge been extended in the interval, and so many facts have been discovered to alter our old views, that the original must of necessity be scrapped in favour of the new work.

The editors of the present edition (Drs. Thursfield and Paterson), have ordered the work of revision, addition and alteration in an admirable fashion, and given us a volume that will be a standard either as a textbook for the student aiming at a qualifying or a higher degree, or as a reference book for the practitioner. The general arrangement of the old volume has been retained, and a great deal is presented in the form in which it appeared there.

There are thirty-six contributors to the work, each of whom is known to us as an authority on the subject with which he deals. They have succeeded in giving between them a complete exposition of the subject of children's diseases. Each disease, rare as well as common, is discussed at length under the usual arrangement of ætiology, pathology, etc. The treatments discussed are markedly practical and sound.

In a volume written by many contributors, it is unusual to find such a uniformity as is evident in this. It is apparent that each contributor has realized the nature and requirements of the task, with the result that, although so many have written, with an authority that an individual could not aspire to, there is encountered no jarring change in style in passing from one subject to another.

That the information conveyed is up to date is evident from the context and from the references, of which enough, and not too many, are given after every subdivision.

The illustrations, practically all reproductions of photographs of cases, pathological specimens, and roentgenograms are excellent and ample. The index references are copious and accurate.

We feel safe in prophesying that a third edition will be demanded long before another fifteen years have passed.

THE GLAXO BABY BOOK.

The Glaxo baby book has been prepared to assist the mother in the care of her child. It comprises just over a hundred pages, attractively bound in cloth and well printed on good paper and contains, in addition to explanatory matter regarding the composition, advantages and method of using "Sunshine Glaxo," a large amount of useful information and advice. Points in regard to the general hygiene of infants, including washing and dressing, breast-feeding, weaning, etc., are given in clear and simple language, and should be of great value to the inexperienced mother.

It is gratifying that no attempt is made to induce the substitution of artificial foods for natural breast-feeding and the policy is adopted of advising the mother to correct any deficiencies she may have in this respect by taking Glaxo products herself.

Short descriptions of the more common ailments of childhood are given with instructions for first aid and the precautions to be taken before the arrival of the doctor.

The book is distributed free of charge, and in the hands of an intelligent mother should do much to lessen the cares of the medical officer in charge of women and children.

COMMON COLDS: CAUSES AND PREVENTIVE MEASURES. By Leonard Hill, M.D., F.R.S., etc., and Mark Clement. London: William Heinemann (Medical Books), Ltd. 1929. Pp. viii + 126. Price 7s. 6d.

In the civilized countries of the world, we pride ourselves on our scientific knowledge of the spread of disease. We talk impressively of the blessings of hygiene, of the gigantic strides which it has made; and we forget the common cold, together with the more pestiferous confederates that march abreast of it along the same blatantly obvious routes.

Dr. Leonard Hill is one of those clear-minded individuals who are keenly alive to the necessity of blocking these routes and eradicating a whole group of diseases which are the result of primeval conceptions of ventilation. The two authors of this book have set themselves the task of educating the general public in the rational methods of preventing the cold and its concomitants. They explain the more obvious mistakes of present-day living conditions. They preach the gospel of fresh air and few clothes, the virtues of vitamines and the salubrity of the sun. It is a good book, and readable. Many points are thrust well home more than once, but that does not matter; the points are sharp and not easily blunted by repetition. Such a book will help to educate the public and lead to respiratory enlightenment, to improved methods of combating the economic losses incurred by apathy and ignorance in the matter of respiratory diseases and their prevention. But the authors have not limited themselves to the subject of colds; they include wider health considerations and deal with the modern aspects of healthy living which are beginning to interest the general public.

M. B. H. R.

THE MEDICAL ANNUAL, 1929. Published by John Wright and Sons, Ltd., Bristol. Simpkin Marshall, Ltd., London. Cash price in the British Isles, 20s. net. Pp. c + 612. Many text illustrations and 71 plates, plain and coloured.

Every medical man should be familiar with this annual publication, and it would appear to be sufficient by way of a review of this year's volume to say that it maintains the high standard of its predecessors. Indeed, the

names of the contributors to this volume, men of eminence in their special line of medicine or surgery, are ample guarantee and recommendation.

It may be of interest, however, to indicate briefly some of the special features of this review of progress during the past year.

Surgery continues to be fruitful in new methods of treatment. A new upper abdominal incision is described which obviates the difficulty of closure, as there is no tension. Discussions on appendicitis, acute and chronic, and its complications receive attention. Special stress is laid upon extrapleural thoracoplasty for the cure of pulmonary tuberculosis and intrapleural thoracotomy for the removal of intrathoracic growths; the former combined with phrenic avulsion, in selected cases, has saved many lives. Further experience in the treatment of ulcerative colitis by cæcostomy and appendicostomy is noted, and a method of performing colostomy in non-urgent cases is described. In right-sided visceroptosis, which is not amenable to medical treatment, colopexy is advocated.

The treatment of fractures is becoming increasingly important and a considerable literature has been reviewed. Improvements on Bassini's operation for hernia are discussed, and improved technique in intestinal anastomosis is given in some detail.

It is pointed out that Leriche's operation of periarterial sympathectomy, in addition to its use in vasomotor disease, has the effect of arresting the process of decalcification, and may be used in the treatment of certain bone and joint infections in which decalcification occurs, such as tubercle, and experimental evidence is now forthcoming to prove that when ligaturing an artery its companion vein should also be ligatured, as a richer vascular bed than that produced by ligature of the artery alone is the result.

Under fractures of the spine a special note is made on the increasing medico-legal importance of Kümmell's disease.

A good account is given of surgery in the tropics.

Details are given of a new rectal anæsthetic, avertin.

Perhaps one of the most noticeable features of this volume is the space devoted to radiology, X-ray therapy and radium. In certain forms of malignant disease radium is proving to be better than surgery. A considerable amount of work has added to our knowledge of the action of X-rays on normal tissues and the effect of deep X-ray therapy on new growths. X-ray diagnosis is dealt with at length, and particularly cholecystography. There is a good article on phototherapy or the therapeutic uses of ultraviolet rays, and the subject is still further discussed in relation to rickets.

Pernicious anæmia and its treatment with liver or liver extracts receives due attention, and a number of recipes for a liver dietary has been collected. Eosinophilia is noted as one of the blood-changes following the administration of liver.

Under the cardiovascular system special reference may be made to the articles on angina pectoris, high blood-pressure, thrombo-anginitis obliterans, and the treatment of varicose veins.

Under affections of the eye the discovery that lysozyme, a component of the tears, is a powerful bactericidal agent, is of particular interest, and recent work on improved methods of treating glaucoma is summarized. The value of optochin in preventing hypopyon is emphasized.

The review of recent medical and surgical practice in the treatment of gastric and duodenal ulcers includes the details of the intensive alkaline treatment, a description of new operative measures and of a new sewing clamp.

Venereal diseases claim considerable attention, and the section on syphilis is well worth study. A new non-irritating silver compound, called citragen, is well spoken of as an injection in gonorrhœa.

Endocrinology is represented by work on ovarian, parathyroid, thyroid, pituitary and suprarenal hormones. It is suggested that the ovary secretes three hormones.

Tropical medicine is not neglected. The bacteriophage treatment of cholera has given some encouraging results. The creeping eruption of South America is found to be due to invasion of skin by the third stage larvæ of *Ankylostoma braziliense*. Further evidence of the greater frequency of bacillary dysentery in proportion to the amœbic form in the tropics is noted. There is a good résumé of recent work on kala-azar and leprosy, including the results of treatment with new drugs. The frequent failure of quinine in the treatment of malaria in India is stated to be due to faulty dispensing. Further evidence as to the frequency of *B. abortus* infection in man is reported. Treatment of plague with anti-plague serum is reported on favourably.

Important work on yellow fever is reported from West Africa, and far-reaching results are expected from the discovery that imported Indian crown monkeys, *Macacus sinicus*, can readily be infected with yellow fever.

Coming to diseases of the nervous system, there are good articles on encephalitis, poliomyelitis and intracranial pressure, and the dangers of malarial treatment of dementia paralytica are noted.

Children's diseases, both medical and surgical, receive due attention.

Lastly, attention may be directed to an article on post-mortem examinations in general practice which cannot fail to be of immense value to the practitioner who accepts the responsibility of investigating the cause of death.

Correspondence.

BLUE SPOTS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS.

SIR,—I was much interested in the Clinical Notes entitled "Blue Spots," and published under the authorship of Major Alexander Hood in No. 5, vol. lii, May, 1929, of the Journal.

It is not easy to make a diagnosis without seeing the case, and this is more especially so in dermatological practice. From the extremely lucid description of Major Hood I should, however, say that this diagnosis is correct.

The condition is well known to dermatologists, and the name used in British practice is *Maculæ cæruleæ*, the terms "taches bleuâtres" and "taches ombres" are of French origin. These spots are not really very uncommon but are usually missed; I have seen a number of such cases, but more, I must admit, in civil than in military practice.

The lesions have only been observed in cases infested with *Phthirius pubis*, and an excellent description is contained in Stelwagon's treatise on "Diseases of the Skin." If space permits, may I be allowed to quote from this work for the benefit of those who have not access to it?

"There are lesions associated with *Pediculosis pubis* (*sic*), known as *Maculæ cæruleæ* (taches ombres, taches bleuâtres, of the French). They are pea- or finger-nail size, of a steel-grey tint, not elevated, with no thickening, and not disappearing on pressure, consisting in fact simply of stains. They are seen most commonly or typically in those of clear, white, transparent skins, usually therefore predominantly in blondes; and are found scantily, or somewhat abundantly, chiefly on the sides of the thorax, abdomen, and inner aspects of the thighs and upper arms. Inasmuch as in the careful hunt for rose-spots in typhoid fever these lesions were occasionally observed, it was at one time thought that they were peculiar to this malady, but it is now known that they are also found in association with other diseases, and also independently. They are simply pathognomonic of the presence of the crab-louse. The view held as to the spots being hyperæmias or hæmorrhages is not supported by their appearances or behaviour. According to Duguet's successful inoculation experiments with crushed crab-louse, they result from the pigment produced by the parasite in the act of feeding; and which, as Pellier's investigations also indicate, is secreted directly by the pediculus. There is, however, a certain predisposition necessary, as they are by no means observed in all those infected with pediculus. Duguet was able to produce the lesion experimentally in all instances in those who already had them, but only occasionally in others. Both Jamieson and Payne have noted in these cases a remarkable absence of the signs of scratching or any complaint of irritation."

I am, &c.,
H. G. WINTER.
Major R.A.M.C.

British Military Hospital,
Solan, Simla Hills, India.
May 28, 1929.

BLUE SPOTS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—I read with much interest Major Hood's note on "Blue Spots" in a recent number of our Journal, and many old war memories were revived.

My first introduction to "taches bleuâtres" was when, as a prisoner of war in Germany, I was called in to diagnose and treat a Russian soldier patient who was running a high temperature, and who was covered with those bluish subcuticular "mottlings."

Typhus was uppermost in our minds at the time, and, in my ignorance, not having previously seen a typhus rash, I hazarded this as a possible diagnosis. A sage old Russian doctor at my elbow, who had fought in many campaigns, whispered "lice-bites" in my ear; so they proved to be, for the man was badly infested with lice, and he did not develop typhus.

Later I saw many similar cases amongst British prisoners of war, some of whom, to the eternal discredit of their captors, harboured pediculi by the hundreds of thousands, from which loathsome pest they were in many cases too weak or too miserable to rid themselves.

A number of these prisoners employed in working parties close behind the German line also suffered from that distressing malady, "famine œdema" (Kriegsödem), the result of faulty and totally inadequate nutrition. One can only guess how this hyperinfestation with lice must have added to their miseries.

Many of the worst cases gravitated to the little prisoners-of-war hospital at Denain (near Valenciennes), where a small colony of British doctors (captured R.A.M.C.), myself amongst them, did what little they could to mitigate the sufferings of these unfortunates.

One outstanding case haunts me to this day. His legs were frightfully swollen and œdematous, he was weak as a rat with chronic dysentery, and he arrived at the hospital gates literally on all-fours, an armed guard with fixed bayonets strutting by his side; his hair, normally dark brown, was grey and rippling like a field of corn as a result of a superinfestation with myriads of pediculi. He was likewise covered with taches bleuâtres.

In the article on "Pediculosis," in Osler and McCrae's "Textbook of Medicine," appears the following:—

"The taches bleuâtres, *Maculæ ceruleæ*, or peliomata, are peculiar subcuticular bluish or slate-coloured spots, from 5 to 10 mm. in diameter, seen about the abdomen and thighs, particularly in febrile cases. The spots are more marked on white thin skins. They are stains caused by a secretion of the salivary glands of the louse."

The following is an extract from the article on "Pediculosis" in the "Official History of the War: Medical Services, Diseases of the War," vol. ii:—

"There are two common symptoms, itching and the presence of small bluish stains on the skin. . . .

"The bluish stains found on the skin in regions infected by the crab-louse are now known to be caused by the bite of that insect. They are probably due to the action of the saliva on the blood at the site of puncture. They are four to ten millimetres in diameter, not raised above the skin, and do not disappear on pressure. They have been known as *Maculæ cæruleæ*, or taches bleuâtres. During the war on several occasions they led medical officers to suspect typhus fever."

In my experience they have only been found in cases of hyperinfestation, and as they furnish presumptive evidence of such infestation when the actual lice are no longer to be found, are, presumedly, of some importance in the diagnosis of such louse-borne diseases as typhus, relapsing fever, and trench fever. It must be remembered, however, that taches bleuâtres are associated with the crab-louse (*Phthirius pubis*), rather than with the head- and body-louse (*Pediculus hominis*), the common vectors of the louse-borne diseases.

MURREE. I am, &c.,
May, 1929. S. S.

MEDICAL APPRECIATIONS.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—A monograph on strategy and tactics in war from the aspect of the Medical Services is long overdue, but can it, bearing official sanction, be produced until some really practicable scheme is available as to the manner in which a medical appreciation should be written. Training and Manœvre Regulations insist on a logical sequence in an appreciation.

I do not think that such articles as have the object of the appreciation: "The Professional Care of the Sick and Wounded and Hygienic Measures necessary to Maintain the Health of the Troops" are logical, for these are the general functions of the Corps. In an appreciation a more specific object is required in order to meet a special idea arising at the moment when an appreciation is called for.

It would be just as logical for a director of engineers to set forth in an appreciation his object as "The Construction and Maintenance of Barracks, Buildings and Fortifications, etc.," or a Director of Ordnance "The Supplying of Armaments, Repair of Machinery, etc." Further, if we do not specify the object accurately and clearly, how can we logically discuss the conditions affecting that object or the plan to meet such conditions?

There has been a certain amount of obloquy aimed at the gentleman known as a "Red-hot Soldier." He is accused of usurping the brains of the General Staff, and, possibly, exercising his military intelligence to the detriment of his professional ability. A very determined effort was instituted to make red-hot soldiers of us on the Depot square on a cold winter's morn long ago. There was rhyme and reason in that. Recently

an officer has written by virtue of his invaluable experience, advising that we should be taught our duties more efficiently.

If we are to deal effectively with a chain of circumstances such as Major Elliott's "Poona" show, which he has so skilfully put before us, do not you think we must have a very clear idea of matters military as well as matters professional, and, indeed, be something more than lukewarm in knowledge of strategy and tactics. It would appear necessary to have a clear idea in this instance as to what the General Staff are driving at. This is quite clear in the special idea—if it is not, we can supplement our information by asking questions. Our object then, surely, is not a general one of attending to the sick and wounded, etc., but a very specific one, and based on the special idea. I would suggest with very great diffidence that our object is to make such medical arrangements as will conform to the defence of our line as outlined in the special idea.

Then the factors influencing our object stand out very clearly, and are detailed exactly in the special idea. It seems to me that the three most important are :—

I.—Probability of Heavy Casualties.

In this we can discuss our medical resources, if sufficient or otherwise to deal with the numbers of casualties estimated. We can also bring in the potential nature of the casualties, "gas," etc. We also know that the enemy will try hard to smash us before a junction is effected (again see special idea).

II.—Indeterminate Plan of Defence.

We do not know on which flank the attack will come—therefore up to the present we cannot tell where our main medical resources will be required ; again see special idea for a clue. We must be ready for either flank.

III.—Geographical Aspect of the Country.

It appears from Major Elliott's article that we might be compelled to use pack transport only on one flank, whilst the other, being in flat country, is entirely suitable for motor transport. This factor would be of the greatest importance in making our dispositions.

Personally I do not see how we can get away from these main factors—our plan must be based on these. I cannot attribute the same importance to many other factors which we might mention in addition to those outlined above.

Red-hot soldier or otherwise, they must be given first place in our minds, and thus I think should likewise be given first place in our appreciation.

I am, etc.,

C. L. Franklin,
Major R.A.M.C.

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EDITOR.
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Original Communications.

THE EVACUATION OF SICK AND WOUNDED BY SEA.[1]

BY SURGEON COMMANDER A. VAVASOUR ELDER, D.S.C., R.N.V.R.

IN the removal of sick and wounded, no matter where, two distinct but equally important factors stand out—the clinical and the administrative. Both must always be carefully considered in order to comply with the two principal postulates for success in the operation. The first of these is to attain a maximum speed compatible with efficiency, while the other is to provide the greatest material comfort and safety of patients in the process. Lack of attention to these points may conceivably be the means of losing lives unnecessarily, to say nothing of the infliction of additional and avoidable suffering.

The evacuation of sick and wounded by water presents all the difficulties encountered on land with the addition of those created by the sea. As the average landsman is handicapped through lack of training and usage when working under marine conditions, it would seem but logical that the water transport of wounded should be undertaken by men familiar with this element.

Incidentally, it may be mentioned that any organized form of water ambulance service may be called upon to deal with three classes of patients—naval, military (including official and other civilians), and Air Force. The psychological reaction of the two latter groups to this unwonted form of transportation, unless too ill to be cognizant of it, is a minor factor which should, however, not be lost sight of by those detailed for this duty. To

[1] The first paper read at the Fifth International Congress of Military Medicine and Pharmacy, London.

the sailor this does not apply so much. He is back among his usual surroundings although under unusual circumstances. He, therefore, "grins and bears it" without worrying too much about "whys and wherefores."

It must be clearly recognized that the actual transport of patients by water is at all times governed by local and weather conditions which vary very considerably. Therefore, beyond enumerating different available methods, it is not possible to lay down any particular one for uniform use. Moreover, actual events in active service are notorious for upsetting plans, preconceived and previously rehearsed during peace-time manœuvres. Hence, in all departments, "preparedness for war" should include one or more alternative schemes capable of being brought into immediate action if the original plan miscarries.

For this reason it is essential that the officers appointed for medical transport duty should be carefully selected. They should be men of ready resource, capable of dealing with unusual or unexpected circumstances as they arise. They should also be given official authority to act accordingly on their own initiative without greatly deviating from the original plan. Briefly, this work calls for men able to attain the object in view without a too rigid adherence to "Service routine." The meticulous "paper and precedent" man will invariably fail when things do not go according to plan. While awaiting orders from a senior officer, possibly unobtainable, all sorts of disastrous incidents may occur.

A point for mention here is the necessity for peace-time practice in the transport of cases in numbers by water. Beyond the sending of individual cases to hospital as occasion arises, this is rarely, if ever, practised as an evolution. It should be considered part of the work of the Medical Branch at "General Quarters" just as much as rigging temporary dressing stations, etc. The organization of naval medical transport *en masse* should not be, as is usual, the result of hostilities calling for it.

Very closely connected with the subject is the matter of appliances and equipment. Just as during peace the strength of the medical personnel of a fighting force is a difficult matter from an administrative and economic point of view, so is the supply of permanent equipment of all descriptions. The director of a fighting medical service is beset by the problem of maintaining a minimum effective personnel with an adequate reserve for immediate expansion on the outbreak of hostilities, without having a plethora. The same applies to equipment ranging from hospitals, etc., to a pair of dressing forceps. While peace prevails there may easily be an excess in every direction deteriorating through lack of use. But the moment war breaks out there is an immediate deficiency; every item in the medical service is wanted in bulk and in a hurry!

For some reason or other this deficit is usually the first to be picked on by the public as a fit subject for parliamentary inquiry, either during or after the war. It is a point which absolutely defies satisfactory solution on an efficient yet economic basis. Nevertheless, it is the first to strike

the public eye when the inevitable breakdown, partial or complete, of the Medical Service occurs. The Medical Director-General at the time is usually held responsible for a state of affairs entirely beyond his control and which is solely the outcome of peace-time restrictions.

There are three stages to be considered in the water transport of wounded—embarkation in the particular craft selected, the transit of this craft to the base appointed, and disembarkation on arrival. The craft used for this purpose may range from a ship's boat rowed or, more likely, towed by a mechanically-propelled vessel, specially constructed self-propelled hospital boats or lighters, and finally to ambulance carriers and hospital ships.

Hospital lighters should be self-propelled—steam or motor—shallow draught, flat-bottomed and blunt-nosed, being fitted with a movable drawbridge in the bows, eight to twelve feet long and nine feet wide, for use when no pier facilities exist. The lighter is driven bows-on to the beach and the drawbridge lowered to serve as gangway. This type of craft is only useful in protected waters and with sandy or gravel beaches, but their sea-going qualities might possibly be added to so as to increase their range of utility.

For open waters, seaworthy self-propelled hospital boats are required. They should have accommodation below for cot and stretcher cases. Companions of extra width should be arranged to facilitate handling. For this work paddle boats are very useful, as their sponsons and paddle-boxes provide good loading and discharging facilities.

The outbreak of hostilities at once calls for more hospital ship accommodation than can be provided during peace. This has to be supplied by merchant ships of the liner type being rapidly converted into hospital ships and ambulance carriers. The latter should be duly registered under the Geneva Convention and thus entitled, after due notification to the enemy, to the immunity conferred by the Red Cross. Strictly speaking, however, this point is outside the Medical Department.

Where ships' boats are used, the method of loading them depends upon pier facilities which, if not actually in existence, will have to be improvised. For loading purposes a boat's crew consists of four men, two being detailed as "boat-handlers" to look after the boat, one in the bows and the other in the stern. The other two, who should be men of suitable strength, are told off as "loaders" to take delivery of the cot or stretcher from the shore bearer-party. At the opportune moment, as decided by the man in the stern-sheets acting as coxswain and in charge, the loaders in the centre of the boat take the case over, laying it across the thwarts close to the side of the boat away from the pier. They then step across in readiness for the next, and so on until the boat is loaded.

A naval cutter or ship's lifeboat will take four Naval Service cots, laid fore-and-aft, and two abreast, or six military stretchers, three abreast. When the boat is loaded, the "loaders" have a "stand easy" in readiness

for unloading, while the "boat-handlers" remain at their stations. The boat is then taken to her destination, usually with several others, by a mechanically-propelled craft. If this be another pier, then the boat is unloaded in a reverse manner. But if, as is more likely, the cases are consigned to a hospital ship or other vessel, then naval cots should be handled as follows: The receiving ship provides a winch and derrick with a single-fall wire rope having a hook at its free end. On to this a bridle of rope or wire, seven feet long for each portion and also having a hook at its free ends, is hooked. The bridle ropes are kept apart by means of a wooden spreader, six feet long and firmly fixed at each end above the bridle hooks. To both ends of the spreader a light heaving line is attached to act as a guy rope during hoisting. The cot is hooked on to the bridle and slowly hoisted on board where it is received by the ship's bearer party on reaching the deck. It is unhooked and the bridle lowered for the next case.

Military stretchers present more difficulty in transfer. They are best handled by means of a canvas sling designed by Lieutenant-Colonel Faulkner, R.A.M.C., for use at the Dardanelles. It is made as follows: A piece of stout canvas, fourteen feet by twelve feet, is laid out flat and a stretcher placed in the centre along its narrower dimension. Where the four stretcher feet come, a hole, slightly larger, is cut out of the canvas and bound with twine. The canvas projecting from each side of the stretcher is then cut into an equilateral triangular shape, the whole being bound round with "one-inch rope" which, at the apex of each triangle, encloses a steel or iron ring. The canvas at the ends of the stretcher is next cut and bound to a shape which will engage the lateral flaps when approximated at their apices. It is made fast to them by a metal hook at each free corner which fits into an eyelet suitably placed in the side flaps. Thus the patient and stretcher are enclosed in a canvas trough, protected from the weather and in no danger of falling out. For use, the sling is spread out flat and the stretcher, with its four feet protruding through the holes, is laid on it. The lateral flaps are hooked on to the winch wire by the ring and hauled taut. The end flaps are next hooked to the side ones and everything is ready for hoisting. Light guy ropes are fixed to the handles of the stretcher nearest the ship's side by a clove hitch or a running noose. Steady attention is kept on them to prevent the sling tilting or bumping while being hauled up. On reaching the deck level it is hauled inboard, the guy ropes being slipped off and thrown down to the boat for use with the next case.

With small boats some difficulty in using the sling is met with owing to lack of working room. This is overcome by placing it, with end and side flaps rolled up, under the last stretcher embarked in the boat with its feet in position in the sling. On arrival at destination all that is required is to hook on and hoist up. The natural tendency of the sling to tilt must be counteracted by the guy rope at the other end, the whole being kept as level as possible.

This sling can be used for naval cots and was found most handy at the

Dardanelles. Several should figure in every hospital ship's equipment. While one case is being handled, the next can be prepared and much time saved. On active service, once a routine had been established, the average time from hooking on a sling to its reception on board was forty-five seconds or less, according to the freeboard of the receiving ship. Where the transfer is made from a lighter or other craft with ample deck space much time can be saved by using two separate derricks and working parties. On several occasions at Mudros this resulted in seventy cases being dealt with in about thirty-five minutes. Needless to state, steady winchmen are essential and the men tending guy ropes should have average horse-sense and pulling power. The coxswain of the boat or craft should be placed in charge of actual hoisting operations, as he is in a better position to judge the critical moment.

For individual stretchers or cots a simple way is to hook the boat conveying them on to a pair of the receiving ship's boat falls and hoist both up together. On reaching the deck rail level the case is taken over by the ship's working party. The reverse is adopted in landing a case. The boat on reaching the water is released and rowed or towed to its destination.

While these methods have advantages of their own in special cases, for general use a cot tray is far superior. Briefly, it consists of a lidless box seven feet long, three feet six inches wide, and one foot three inches deep, as to internal measurements. To facilitate loading, the end-pieces are hinged to let down, being kept in position by hasps and pins fitted to the side-pieces. They are also suitably slotted to take the handles of a stretcher. At each corner, wire slings of appropriate length and strength terminating at a central ring are fitted and the appliance is complete. The winch wire is hooked into the ring. The guy ropes for this tray should be kept permanently attached at both ends of one side, being coiled up inside when not in use. The tray should be hooked on so that the guy ropes are on the side next to the ship. This gives greater control in preventing it from bumping during hoisting.

The advantages of the tray are that it is solid, giving the patient a feeling of security while in mid-air, the depth obscuring a view of anything but the sky. It can be used equally for cots or stretchers and even for non-cot cases. Owing to its area it is not very suitable for removing cases directly from a loaded ship's boat; the Faulkner sling and bridle are much better. All hospital ships and ambulance carriers should be supplied with several trays for general use as well as with a Faulkner sling and bridle for those occasions when a tray is not suitable.

The mention of cots and stretchers raises an important point. It is admitted that each Service—Navy, Army, and Air Force—must have appliances specially designed to meet its own internal needs in certain circumstances, but not necessarily in all. Among such may be cited the stretcher. Apart from individual instances peculiar to itself, every Service requires an appliance for the transport in general of its sick and wounded.

It should, therefore, not be difficult to design a stretcher for general use with all forces.

A standard stretcher could be made as follows: To the ends and sides of an ordinary army stretcher, canvas flaps are fixed. Those at the head and foot are nine inches wide, while those along the sides measuré eighteen inches. The end and side-pieces are lashed together by boatlacing as required. The lacing is kept permanently fastened to each stretcher handle and is part of the appliance. Brass eyelets are let into the flaps. By this means the wooden framework of a naval cot is represented by the two stretcher poles, while its canvas flaps are added to the Army stretcher. When not required the flaps can be laid flat in the stretcher before the patient is put on it. To enable this appliance to be slung, a bridle terminating in a metal ring is permanently fastened to the handles at each end, while a mattress, pillow and two blankets complete the equipment. Conceivably the canvas could be cut out of one piece, the stretcher poles being rove through a loop made in it, as obtains in the Naval Service stretcher. The metal cross-pieces or spreaders would be hinged to admit of folding for stowing purposes.

The advantages of such an appliance will be more readily seen by a comparison of the distinctive points of existing official ones, which are as follows:—

(1) The Army stretcher is narrower and less cumbersome than a naval one.

(2) The Army stretcher only requires two bearers, while the naval cot calls for four.

(3) The Army stretcher can be placed on the ground resting on its four feet and keeps the occupant clear of water, etc., whereas the naval cot absorbs moisture and picks up dirt unless the ground be dry.

(4) As at present constructed, an Army stretcher cannot be slung without a temporary sling being improvised; a naval cot can.

(5) An Army stretcher will only fit an Army ambulance and, *vice versa*, a naval cot will not go into an ordinary ambulance.

(6) A plain stretcher is not nearly so comfortable for the patient as the fitted naval cot, especially if occupied for any length of time.

All these points would be either eliminated or met, as the case may be, in the appliance described above. It would also have the added advantage of service interchangeability and thus do away with the necessity of transferring the patient in the process.

During the war the Navy adopted the system whereby a sick or wounded man was placed in a cot at the "front," i.e., ship. He and his cot travelled together to the base hospital without further transfer than directly into the bed in the ward. Each link in the transport chain—ambulances, trains and hospital boats, etc.—was fitted to its carrying capacity with empty,

clean cots which were given in exchange for an equivalent number of loaded ones received for transfer. Thus, barring any extra cleansing necessary, each unit was automatically ready for further service immediately after the completion of any particular one. The base hospitals cleaned the cots as received and kept up the supply of clean cots which circulated throughout the whole transport system to the ships at sea, and were eventually returned to the base with a patient. After cleansing, the circle was resumed.

By this system, all moving of patients after being placed in a cot was avoided until they were actually put to bed in the ward. Through a method of suspension with semi-rigid fixation in the ambulance trains, all jolting and jarring was eliminated during transit, and the train could discharge 140 cot cases in twenty minutes, leaving the line clear for other traffic. The many stretcher-transfers between casualty clearing station and base hospital were avoided and the comfort of patients greatly added to in consequence.

Although not strictly part of the subject under review, this point of a standard stretcher for universal and inter-service use has been considered at length owing to its manifold advantages. The objections to it can be anticipated as being both theoretical and practical in nature. The former may be summed up in "Service custom and usage," while the latter consists in the large number of appliances required to maintain this endless transport chain. From an efficiency point of view, "Service custom" should not be allowed to obstruct. While from the "stores" side, as the stretchers would be uniform for all Services and thus pooled, so to speak, it would resolve itself into a simple matter of Service exchange. All further supply required would be issued from a common store depot to the particular force needing it. This, it is true, would call for large reserve stocks, but probably no more than those of the separate Services combined, the cost of which when totalled up would most likely exceed that of a standard supply for all the armed forces. The same principle could also be applied to many other items of equipment, greatly to the benefit of the public treasury and without loss of efficieney.

To avoid undue waste of public money entailed by the sudden scrapping of existing separate Service stocks, if this suggestion of a standard stretcher for all Services is adopted, then, once a pattern has been agreed upon, it should be issued in replacement and thus gradually brought into service in an economic manner. In the meanwhile, reserve supplies would be in process of manufacture. A minimum amount of what might be termed special "Service appliances" would, however, still be issued to each force in accordance with its own special requirements as heretofore.

Mention may here be made of the stretcher bearing his name devised by the late Fleet-Surgeon Neil Robertson, R.N., and adopted officially in the British Royal Navy. Briefly, it consists of canvas flaps stiffened at intervals with strips of split bamboos of suitable size which are firmly sewn on to it. The flaps are cut to fit round the patient, being approximated by opposing straps and buckles. At the head and foot are bridles with a metal

ring at the end. At the crutch are two straps which buckle across the patient to each shoulder-piece and so prevent him slipping down when the stretcher is held or slung vertically. Once the flaps are buckled together the stretcher can be carried in any position without injury to the patient.

Strictly speaking, the term stretcher is a misnomer. A splint enclosing the whole body, in the manner of Gooch splinting, is a more accurate description of the appliance. Its advantages are lightness and compactness in stowing; ease of application and small "displacement," the latter being no more than that of the patient. This is a very great factor in Naval Service when alley-ways are often narrow and tortuous; also the ability of handling it in the erect position makes it especially suitable for bringing cases up through man-holes and small trunk-ways in perfect safety and comfort.

The drawbacks of the appliance are two. The first, and a very minor one, is that of standard size. This could be overcome by having several sizes, or better still, in modifying the original by means of facultative extension pieces. The most important drawback is its use in cases of respiratory embarrassment, such as pneumonia, thoracic injury, etc. In these cases, as the patient is so strapped in, forced inspiration is almost impossible. On the rare occasions—and for which it was never intended—when it has to be used for cases of this type, the chest flaps should only be fastened at the last moment and released at the earliest opportunity. Since the advent of gas warfare a modification of the existing model is required for patients wearing gas masks

Beyond these objections, the stretcher is ideal for naval use. It is, in fact, one of those special appliances already referred to and quite indispensable for ships. During the war it was also found very useful for narrow trenches in France and Gallipoli.

Far more comfort and safety for patients in transfer is obtained when this can be effected by means of connecting gangways between transport units instead of by a hoisting process. The latter is bound to arouse an element of timidity in even the most fearless. It should, therefore, be avoided as much as possible, quite apart from risk of accidental and possibly injurious bumping against the receiving ship's side while suspended in mid-air.

Weather conditions permitting, it is generally possible and most desirable to lay ships alongside each other and transfer patients directly by means of gangways. This ensures much saving of time and absence of discomfort to patients; it is no more than transfer from one hospital ward to another. During the Gallipoli campaign, on several occasions in Mudros harbour, the "Aquitania" and "Mauretania," then acting as registered hospital ships, had four smaller ones tied alongside, two on each side and connected by gangways. By this means, "Aquitania" once embarked over 4,000 cases—stretcher and walking—in twenty-six hours, with practically no discomfort to them.

This system was initiated and developed by the Royal Naval Medical

Service when in charge of the sea transport of all sick and wounded from the Gallipoli area between August and November, 1915. It was directly due to two factors. The base hospitals of Egypt and Malta were congested with men unfit for further service who required repatriation, and the second factor was the arrival in the Mediterranean as hospital ships of the "Aquitania" and "Mauretania." Their case-capacity was 4,000 and 2,500 respectively. Mudros was the only port in the area considered suitable for them. As these numbers of permanently unfit cases could never have been obtained from the Mudros hospitals alone for any one homeward sailing of these huge ships, all cases of this type in Alexandria and Malta were brought to Mudros in the hospital ships attached to the Mediterranean Force as they were returning empty there for further "station duty" off the Gallipoli beaches. This obviated detaching special ships for their conveyance to England direct, and, incidentally, saved losing the use of these ships for a period of six weeks or more, especially at a time when all available ships were urgently required for duty in the area.

It was evident that the resources of Mudros—where stores of every description had to be sea-borne—in regard to coal and water alone for these ships, even while at anchor, were going to be severely taxed by their presence. Therefore, to avoid undue demurrage, it was decided to lay the smaller hospital ships alongside and transfer their cases direct by gangways. The arrival of the latter was timed to coincide with that of the big ships so that no delay would occur. The net result of this was that cases arrived in England in three or four days less, including their transit time to Mudros, than if sent direct from Alexandria or Malta. Furthermore, they travelled in ships of 45,000 and 30,000 tons instead of an average of 6,000, with much greater comfort. Also, the large ships were filled almost to capacity on each trip to England and very little accommodation was wasted.

This process of laying ships alongside one another, even under favourable weather conditions, created considerable demur at first on the part of the mercantile marine shipmasters in command of them. They raised various objections which were overruled by naval authority. The most general of these was on the score of the ship's lifeboats, always kept swung out ready for immediate use in case of need. This objection was met by ordering the boats to be swung inboard during the operation. Another point was the possibility of ships damaging each other while coming or lying alongside. Mats and fenders diminished this risk. The only demur for which a valid reason certainly existed was in odd cases of overlapping propellers. Such did obtain in a few particular pairs of ships ordered to carry this evolution out. In these instances the routine was naturally not enforced.

It does not require a skilled seaman to gauge conditions more or less accurately regarding the feasibility of laying ships alongside each other. The actual process is, of course, a matter for their respective commanders and not the medical transport officer; the blame for any accident is not his, but attaches to the captains concerned. As professional seamen, the problem

is for them to solve. Having been successfully performed in the past, it is, therefore, capable of repetition when future occasion demands. As already stated, weather and local conditions must always be the deciding factor in attempting direct transfer from ship to ship. But, from the medical transport point of view, it is ideal for complying with the two main postulates of all ambulance work. This part of the subject has been dealt with somewhat fully because the incidents quoted actually occurred in the past, and will, no doubt, recur in the future unless the officer in charge of medical transport is aware of the possibility and insistent upon the performance of this evolution, subject always, of course, to weather conditions.

In view of the advantages of communicating gangways over hoisting operations, all hospital ships built as such, or taken over subsequently for permanent conversion, should be fitted with one or more entry ports on each side. In size they should be not less than six feet six inches in width and extend from deck to deck. One set should be on the deck nearest to the water-line, and every deck fitted for the accommodation of patients should have entry ports on both sides with sufficient space inboard to allow of stretchers being conveniently handled when received on board.

The objection of naval architects to this suggestion on the ground of possible weakening of the ship's side can be anticipated by extra strengthening plates suitably placed to overcome this. This already obtains in the larger liners, most of which have one or more entry ports on each side. In the case of merchant ships building which are likely to be taken over for hospital ship purposes in the event of war, the Government department responsible for chartering should require them to be so fitted, or, alternatively, only take over for hospital ship service those possessed of them.

Once in a hospital ship or ambulance carrier, stretchers and cots should be placed on a two-wheel "bogie" carriage fitted with rubber or pneumatic tyres, being wheeled along alley-ways to the nearest companion or lift with which the ship will presumably be fitted. This saves time and also jarring of patients in transit as compared with a bearer party. A number of these "bogies" should be supplied to every hospital ship and ambulance carrier.

Throughout this paper frequent reference to hospital ships and ambulance carriers has been made. A few words on the difference between the two types of craft may not be out of place. Hospital ships, as the name implies, are ships fitted for the purpose of acting as floating mobile hospitals, and are equipped with all the appliances to be found in hospitals on land. One or more of these is usually to be found in the list of auxiliary ships attached to every fighting fleet, similarly to repair ships, depot ships, etc. On the outbreak of war this number is added to, according to estimated requirements, by the conversion of suitable ships drawn from the merchant service and fitted up for this duty. On the other hand, ambulance carriers are not as a rule permanent units of a fleet, and are obtained from the passenger-ship class of the mercantile marine on the outbreak of hostilities. Primarily, they are used as medical transports for the carriage of sick and wounded. While supplied with a certain amount of medical stores and

equipment, they are not fitted out on the same extensive scale as hospital ships.

Arising from the foregoing, and perhaps outside the immediate scope of this paper, is the consideration of the feasibility in future instances of combined naval and military operations—including therein the Air Force—of establishing a water transport service for casualties in all branches of the armed forces. This would be organized and operated by the Naval Medical Service, the land transport of sick and wounded being allocated to the Military Medical Authorities. Cases requiring transport by air would naturally be dealt with by the Air Force Service.

This may appear somewhat radical and perhaps premature, but with a view to increased efficiency in the transport of casualties in combined military operations, it is put forward as a constructive suggestion for inquiry as to practicability. A further and possibly fanciful development of this idea would consist in the establishment of an independent medical service prepared to transport casualties by air, land or water, as the case might be. Precedent for this exists in the establishment of the Royal Army Medical Corps and Royal Army Service Corps to supersede the old system of regimental officers for these duties. Custom dies hard, but because a system has not hitherto existed is no valid reason for not considering its possibilities and giving it a trial after fair and unbiased deliberations.

Apart from the administrative side there is the clinical one, which is equally important for success in the transport of wounded by water. Briefly, as already mentioned, it is summed up in providing the maximum comfort during transit compatible with speed. This includes the alleviation, as far as possible, of pain, hunger or thirst, heat or cold. Under certain conditions, annoyance to patients from flies or other pests should be guarded against by suitable means. The sedative effect of tobacco should also be borne in mind and a supply of matches and cigarettes provided. At the same time, the undesirability of smoking for cases of gas poisoning is a factor to be considered, and should be regulated by the medical transport officer.

In the intermediate stage of transport between shore and ship there is not much which can be done. With regard to pain, loosening a tight bandage or dressing will often work wonders, but the main point is the use or withholding of morphia. Where a medical officer forms one of the transport party, this difficulty is diminished, but in the absence of one morphia cannot very well be given by a sick-bay man or medical orderly. Nevertheless, I am convinced that more lives after action have been lost from unrelieved "shock" than by the administration of morphia. Some anodyne in tablet form, such as tinct. opii. 10 minims, or allonal, should figure in every medical valise in addition to, but not in lieu of, morphia.

Under active service conditions morphia is best given in solution by a Wildey's syringe or a "tubunic," the latter being ready sterilized for use. The cost of the latter for wholesale use, however, is a serious drawback. Doses of morphia put up in gelatine, perforated like stamp paper which

can be torn off as required, may be used in cold climates, but in the tropics the gelatine is liable to liquefy. In this form, therefore, it is not suitable for general use, quite apart from any question of its efficacy when given by the mouth, which appears to be a matter of controversy not definitely determined in the late war. Whenever morphia is given, the time and dose should be marked on the patient's label.

Each intermediate transport unit—boat, lighter, etc.—should carry a plentiful supply of fresh water to which lime juice in the proportion of one in twenty has been added. This makes a very good thirst quencher. Stimulants such as hot coffee and cocoa should be carried in thermos flasks. Egg flip, too, is another nourishing and stimulating mixture. The supply of these should be renewed by the hospital ship at each trip. Tarpaulins and a few blankets should figure in the equipment in case of need for protection against the weather. This, however, is not always easy to provide in every instance. Where the transit time between shore and ship is of any duration, these points become all the more important and must be duly regarded and provided for.

In so far as the final stage of transport from "front" to "base" is concerned, the welfare of patients becomes a matter of hospital ship routine and administration, and as such it is somewhat beyond the immediate scope of this paper. It is in effect a special subject in itself, and one to be dealt with by officers fully conversant with it. There are two points, however, which should always be borne in mind by senior medical officers of hospital ships. Purely surgical cases resulting from gunshot or other injuries generally have a good appetite, which is considerably augmented by the tonic effect of sea air, more especially after the hardships of front-line trenches. Therefore, in the absence of clinical contra-indications, the dietary scale for these should be simple but generous, and, as regards quantity, in excess of the "pound-and-pint" allowance laid down for medical establishments ashore. The accelerated return to duty of these cases more than makes up for the cost of extra victualling. It also reduces the amount of complaint, mostly unjustifiable, made by patients with nothing to do and all day to do it in.

Another important point is that of batmen accompanying officer-patients in hospital ships. Primarily this is strictly against the Geneva Convention regarding the carriage of healthy combatants under the protection of the Red Cross flag. Secondly, it robs the firing-line and encumbers the ship with men for whom she has neither use nor accommodation, her own staff being presumably adequate to meet the requirements of the sick. Notwithstanding any pressure to the contrary which may be brought, this practice should never be permitted.

Violation of the Geneva Convention has been complained of by both sides in recent wars. Some of these instances would appear to be deliberate; others more the result of ignorance of its terms on the part of the offenders. If the Red Cross is to stand for anything, then too much attention cannot be given in strictly observing the regulations governing its use!

THE MALARIA TREATMENT CENTRE—KASAULI.

By Major S. SMITH,
Royal Army Medical Corps.

(*Continued from p.* 93.)

That a *persistent* search for malaria parasites must be made in all cases in whom the cause of the pyrexia is uncertain is exemplified by the following case:—

Case 2.—Signaller H. was admitted to the B.M.H., Sabathu, on September 22, 1928, complaining of generalized pains and fever. There was no previous history of malaria and he had been at Sabathu without a break since March.

Blood-slides were negative. On the day following admission the percussion note and air entry were slightly impaired at the base of his right lung and his sputum was tinged with blood. He was transferred to the

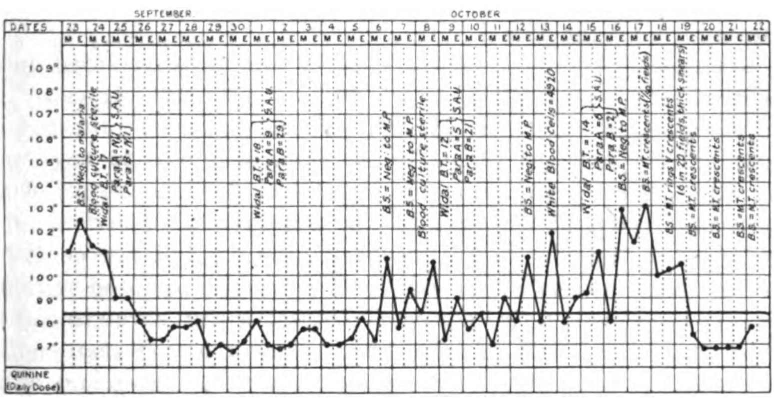

Chart II (*Case* 2).—The slight tendency to tertian periodicity during the second pyrexial attack will be noted, also the double rise in twenty-four hours on October 16 and 17, with slight remission, characteristic of M.T. malaria. Although the marked variation in Widal from week to week suggested enteric group, the irregularity and intermittency of pyrexia were points against this diagnosis. The fever and asexual forms of parasites rapidly responded to quinine, but the crescents persisted until plasmochin had been administered later.

B.M.H., Kasauli, on September 24, 1928, as a case of lobar pneumonia (?). No definite signs could now be heard in his lungs and his sputum was scanty and normal, a blood-culture was sterile and a total white count gave 6,864 cells per cubic millimetre (unlike lobar pneumonia in which a leucocytosis, usually marked, is the almost invariable rule). After three days' continuous pyrexia his temperature dropped to normal where it remained for ten days. On the eleventh day he commenced to run an

irregular, intermittent, fever of moderate amplitude. Blood-culture remained sterile. There was a leucopenia (4,920 white blood-cells per cubic millimetre) and a relative and actual lymphocytosis. After numerous negative blood-slides, one crescent was found after prolonged search through a thick film on the twelfth day of this second pyrexial attack. On the following morning rings and crescents were present in moderate numbers in his peripheral blood, and his pyrexia showed immediate and lasting response to quinine.

This patient was one of several who were primarily infected with fresh malignant tertian malaria at Sabathu (5,100 feet).

Had he been admitted to the malarial section of this hospital where films are examined thrice daily, instead of to the general wards where the examination of blood-films is more perfunctory and irregular, the cause of this second pyrexial attack would in all probability been discovered far sooner.

As noted above, we have fixed freedom from relapse over a period of eight weeks following cessation of treatment as our arbitrary standard of cure. Whilst aware that a certain percentage of cases relapse after this observation period, the numbers that do so are probably small; moreover, it is not thought advisable or justifiable to keep healthy convalescents from their units for a longer period.

Of a series of 75 malaria convalescents who have relapsed during the year whilst under observation at the M.T.C., 16 (21·3 per cent) relapsed within one week of arrival at M.T.C. (of these 5 were admitted on day of arrival); 23 (30·7 per cent) relapsed within one to two weeks of arrival; 13 (17·3 per cent) relapsed within two to three weeks of arrival; 6 (8 per cent) relapsed within three to four weeks of arrival; 6 (8 per cent) relapsed within four to five weeks of arrival; 3 (4 per cent) relapsed within five to six weeks of arrival; 3 (4 per cent) relapsed within six to seven weeks of arrival; 2 (2·7 per cent) relapsed within seven to eight weeks of arrival; 3 (4 per cent) relapsed after a longer period than eight weeks from date of arrival. The actual percentage of those relapsing after a greater period than eight weeks from date of arrival is probably somewhat greater than 4 per cent as many convalescents rejoined their units after an observation period of eight to ten weeks, and no further record of their malarial history was available. Thus 72 (96 per cent) relapsed within eight weeks from date of arrival.

From a perusal of the medical history sheets of those with a record of more than one attack of malaria, it was noted that only very exceptionally was there more than one entry for a fresh infection, all subsequent admissions being recorded as relapses, no matter how long an interval existed between any two attacks. An examination of the medical history sheets of thirty-three malaria convalescents revealed the interesting fact that in five instances only was there an interval of less than six months between the primary attack of malaria and the first relapse, the average interval for the

remaining twenty-eight cases being 8·4 months. In only one instance was there a record of two fresh infections on the same sheet, the interval in this case being a year.

It is significant that the first relapse (so called) commonly occurred during the spring when mosquitoes are commencing their activities following a primary infection the previous summer or autumn. Thus, of a series of 51 fresh infections, 1 occurred in January, 1 in February, 1 in April, 1 in May, 12 in August, 11 in September, 14 in October, 5 in November, 5 in December.

Of 34 first relapses (so called) 2 occurred in March, 3 in April, 6 in May, 5 in June, 5 in July, 7 in August, 5 in September, 1 in October; November to February, cold months, when true relapses might be considered to be of common occurrence, were free in this small series. It is suggested that many of these (so-called) relapses are in fact reinfections of susceptible individuals.

As a corollary to the above it is possible that in many stations a high curve for fresh malaria infections may depend more on the presence in them of a large proportion of new arrivals from a non-endemic area than on any undue mosquito prevalence.

In the case of a salted unit containing a high percentage of men who have suffered from malaria, any attack of malaria, however long the interval separating it from the previous admission for the same disease, is almost invariably diagnosed as a relapse providing the man has had at some time or other, possibly in the dim and distant past, a previous entry for malaria.

TREATMENT.

The testing of various forms of treatment has been and remains our official *raison d'être* and has proved the most interesting and instructive part of our work.

Malaria, especially benign tertian, would appear to be an ideal disease on which to test the efficacy of different lines of treatment.

The virulence and symptomatology (of benign tertian) remain fairly constant from year to year and from individual to individual and the causative organism is not in doubt. An excellent check on the immediate therapeutic effect of any drug is afforded by its action on the pyrexia, or, better, on the parasites in the peripheral blood. Its final curative power may be accurately gauged by the relapse rate. A sufficiency of cases for the collection of reliable data is usually easily come by, a most important factor in the assessment of the relative value of any particular line of treatment (unfortunately we have suffered from a dearth of cases at the M.T.C. this year during which there has been remarkable freedom from malaria throughout the military population of India). Finally, in quinine we possess an excellent control treatment of proved value.

Sinton and others have laid down the following desiderata for an ideal treatment of malaria:—

(1) It should bring about a rapid cessation of the symptoms complained of by the patient and of any acute condition which is likely to be dangerous to his life.

(2) It should cause no harm to the patient, i.e., there should be an ample margin between the therapeutic and toxic doses to allow for individual idiosyncrasy.

(3) It should destroy all parasites in the body or at least bring about such a condition that the natural defences of the body can complete the destruction, thus preventing recurrence of symptoms with reinvasion of parasites into the peripheral blood at a later date.

(4) It should rapidly destroy all the sexual forms of the parasites in the peripheral blood and so prevent the patient becoming a "carrier" of the disease.

(5) It should, if possible, be effective against all the different species of malaria parasite.

(6) It should be cheap (not so important in the case of the military population, an expensive drug, if efficacious, proving far cheaper in the long run than numerous relapses of malaria).

Up to the present our attempts to find this ideal remedy have not been entirely successful, although in plasmochin, especially in combination with quinine, we appear to possess a drug which fulfils many of the above postulates. Unfortunately, as at present prepared, it offends against postulate "2," the therapeutic and toxic doses being, in many cases, dangerously near each other.

During the past few years many drugs have been investigated at the Centre and full details regarding their action published.

Trial was made last year with plasmochin and plasmochin compound, chiefly by the interrupted method advocated by Dr. P. Muhlens. The results obtained during this trial by Majors Sinton and Bird form the substance of a recent article, and their conclusions may be summarized as follows:—

The daily dosage of plasmochin varied between 0·06 and 0·1 gramme, duration of treatment seventeen to twenty-eight days, with additional rest days on account of, or to prevent, toxic symptoms. The relapse rate of fifty-one patients treated for benign tertian with plasmochin alone was 30 per cent and of thirty-five treated with plasmochin compound (plasmochin combined with quinine) 8·5 per cent, as against a 70 per cent relapse rate with quinine.

Continuous treatment appeared more efficacious, although more liable to produce toxic symptoms, than the interrupted treatment originally advocated by the makers of the drug. Plasmochin and plasmochin compound were not so efficacious in the clinical treatment of malignant tertian as the quinine-alkali (Sinton) method, but their striking effect on the

crescents was noted. Severe toxic symptoms followed the use of plasmochin and the margin of safety with the present dosage was small.

During the present year (1928), two series of test treatments have been under trial, quinine being used as a control in each case.

The test treatments tried have been: (1) Parosan oxide and quinine parosan oxide; (2) plasmochin given with quinine in solution; (3) control: quinine sulph. 10 grains, acid citric 30 grains, mag. sulph. 1 drachm, aq. *ad.* 1 ounce, t.d.s. for twenty-one days.

In addition calomel 3 grains has been given in all cases on the night of admission followed by mag. sulph. the following morning.

In testing the various treatments special attention has been paid in each case to:—

(1) Immediate action on (i) temperature, (ii) splenic enlargement, (iii) parasites in peripheral blood.

(2) Remote effect on relapse rate.

(3) Toxic symptoms.

(4) Effect on general condition as shown by (i) gain or loss of weight, (ii) gain or loss in hæmoglobin percentage.

Parosan oxide (P.O.) and Quinine parosan oxide (Q.P.O.) were sent to us for trial by the manufacturers, May and Baker, who reported promising results with them in the treatment of bird malaria. Parosan oxide is closely allied to stovarsol. It has been found relatively non-toxic for mice.

A small series of six cases was treated with P.O. in the dosage recommended by the makers (six to nine tablets daily for fourteen days), preceded in each case by sugar mixture (i.e. sugar 5 drachms, sodii bicarb. 10 grains, limejuice 10 minims, aq. *ad.* 1 ounce), to protect the liver, as is our rule with all drugs containing arsenic.

Of this small number:—

One case of malignant tertian malaria relapsed while still under treatment (tenth day), with P.O. One case of benign tertian relapsed on the day following completion of a fourteen-day course. One case continued to show benign tertian parasites in his blood after nine days' continuous treatment with P.O.; treatment was then changed to plasmochin (0·03 gramme) by daily intramuscular injections, his blood becoming free from parasites in two days. The three remaining cases have not relapsed. No toxic effects were observed.

Fourteen cases were treated with Q.P.O. The immediate therapeutic action was poor (*vide* Table III), and the effect on the relapse rate (50 per cent. relapses) was no better than that recorded with P.O., and not to be compared with the results obtained with plasmochin.

One case relapsed five days after completing his fourteen days' course of Q.P.O. One case continued to show benign tertian parasites in the peripheral blood for ten days after commencing treatment with Q.P.O.; treatment was then changed to plasmochin by intramuscular injection, the

blood becoming free on the second day following the change of treatment.

As in the case with P.O., no case developed toxic symptoms while under treatment with Q.P.O.

PLASMOCHIN.—It was hoped to give an extended trial of this drug during the year, but at the outset we were faced by an excessive percentage of cases exhibiting toxic symptoms, and ceased treatment with it for a time.

We have recently recommenced treatment with the drug in smaller doses given in conjunction with quinine in solution (plasmochin 0·04 gramme, quinine sulph. 20 grains daily); only a few cases have complained of slight abdominal pain necessitating withholding plasmochin for a few days, and the immediate effect on the relapse rate has compared favourably with that produced by the drug when given in toxic doses.

Plasmochin is a synthetic derivative of quinoline which is stated by the Elberfeld chemists, Drs. Schulemann, Schonhofer and Wingler, who first prepared it, to be a salt of alkylamino—6—methoxyquinoline with a formula analogous to that of quinine. The drug was orginally termed beprochin, but has been put on the market by Bayer under the trade name of plasmochin or plasmoquine. The drug is obtainable as: plasmoquine tablets 0·02 gramme ($\frac{1}{3}$ grain); plasmoquine co. tablets containing 0·005 gramme ($\frac{1}{13}$ grain) plasmoquine and 0·0625 gramme (1 grain) quinine: plasmochin ampoules for intramuscular injection.

A considerable volume of literature has appeared during the past year dealing with treatment by plasmochin, and whilst all appear in agreement concerning its valuable therapeutic action there is unfortunately a corresponding unanimity of opinion regarding the toxic effects produced in a certain percentage of cases; at least two deaths directly attributable to its use have been recorded recently, and probably other similar fatalities have occurred which have gone unrecorded.

In certain published accounts there has been a regrettable laxity concerning the position of the decimal point in describing the dosage of plasmochin, thus in one article in a leading medical journal the daily dose recommended is 0·75 gramme instead of (one supposes) 0·075 gramme; this is all the more serious when one remembers the small margin of safety there is in plasmochin dosage.

The chief toxic effects reported as attributable to plasmochin have been gastric pain and distress, cyanosis, headaches, dizziness, and in a few more serious cases hæmoglobinuria, jaundice, and hæmorrhagic nephritis. The cyanosis has been shown by spectroscopic tests of the blood to be due to true methæmoglobinæmia.

All are agreed that immediate cessation of treatment is necessary when toxic symptoms occur and that treatment with plasmochin should not be recommenced until some days after the symptoms have disappeared.

Our first series of sixteen cases was treated with plasmochin 0·06 gramme, quinine sulph. 20 grains daily.

Our intention was to give each case a twenty-one days' course, but

treatment with the drug in this dosage was stopped after the occurrence of toxic symptoms in a large percentage of cases (62·2 per cent), the twenty-one days' course being completed with quinine alone (quinine sulph. 10 grains t.d.s.).

For this reason only six cases completed their full twenty-one days' course with plasmochin, the remaining ten each receiving an average of 9·3 days' treatment with the drug.

Of the ten cases in whom toxic symptoms appeared, nine complained of epigastric pain of greater or less degree which in two was sufficiently severe to necessitate admission to hospital. Cyanosis, in addition, was noted in four of these, and one had bradycardia (pulse rate 44-48). One complained of loss of weight and anorexia commencing immediately after completion of a full twenty-one days' course.

It was noticed that those who complained of the most severe symptoms were heavy cigarette smokers (thirty to fifty daily).

This observation is interesting, in view of the fact that the toxic effects produced by plasmochin are attributed by some to vaso-motor disturbance.

The cause of the epigastric pain has remained somewhat obscure. It has been attended in our series with no signs of gastro-enteritis, such as vomiting or diarrhœa. The pain is usually described as heavy and constant, situated horizontally right across the mid-epigastrium.

It has been much the most common toxic symptom complained of and has invariably ceased after a few days' withdrawal of the drug. Readministration of plasmochin after cessation of the pain has in all but a few cases been unattended by recurrence of symptoms. This is, in our opinion, opposed to the theory that the drug has any marked cumulative action and suggests that most patients are able, after a few days, to take the drug without toxic effects.

Toxic symptoms, when present, occurred most commonly on the sixth to ninth days of treatment. In spite of the short and interrupted course with plasmochin undergone by many patients in this series, none have relapsed after a full eight weeks' observation period following cessation of treatment.

Later in the year we received a small quantity of a one per cent solution of plasmochin put up in ampoules containing 1·2 cubic centimetres and 3·2 cubic centimetres (approximately 0·01 gramme, and 0·03 gramme plasmochin).

A small series of six cases received daily intramuscular injections of the larger dose and quinine (10 grains) by the mouth for six days followed by an eight-day course of quinine alone (quinine sulph. 20 grains daily).

None of the cases so treated have complained of pain at the site of injection (muscles of the buttock) either during or after injection, none exhibited toxic symptoms. The immediate therapeutic action was good (*vide* Table III) and the relapse rate *nil*, a full observation period of eight weeks having been completed in each case.

Recently we have recommenced treatment with plasmochin in minimal dosage by the mouth, and quinine in the following mixture; plasmochin 0·02 gramme, quinine 10 grains, twice daily for twenty-one days.

To date, thirty-six cases of relapsing benign tertian malaria have received or are receiving combined treatment with plasmochin and quinine in the above dosage. The immediate therapeutic action in this series has been good, comparing favourably with plasmochin in larger dosage, and the relapse rate to date is 5·9 per cent, although it must be admitted that only about two-thirds of the cases in this group have completed their two months' observation period.

The percentage of those exhibiting toxic symptoms (seven cases in all in this group) has been small, and slight abdominal pain (necessitating a few days' withholding of plasmochin) has been our sole reminder that we are dealing with a dangerous drug.

In addition to the above, plasmochin was given to a few cases suffering from malignant tertian malaria, in whose blood crescents persisted after a week's treatment with quinine and alkali. A week's course of plasmochin (0·02 gramme daily) appeared to free the peripheral blood of crescents in these cases.

Although we have had but few cases of severe intolerance following and during treatment by plasmochin at this centre, we had one patient who, previous to his transfer to the M.T.C. (as a relapsing malignant tertian malaria) was dangerously ill following the administration of admittedly toxic doses of plasmochin, due to a misunderstanding as to the correct dosage. His chief symptoms were cyanosis, vomiting, epigastric pain, tenderness over the liver and spleen, jaundice, transient hæmoglobinuria and nephritis, followed by persistent anæmia.

This case is an excellent example of the fallacy of the argument, brought forward by some, that plasmochin, in order to produce a cure in malaria, must be pushed sufficiently to produce toxic symptoms. This patient relapsed four times after arrival at the M.T.C. and was finally invalided to the United Kingdom.

That abdominal pain occurring during the administration of plasmochin may be due to other causes than the drug is shown by the following case, who was admitted complaining of *generalized* abdominal pain, (*not* confined to the epigastrium) whilst under treatment with plasmochin. On the day after admission he commenced passing dysenteric stools from which B. Flexner was isolated on two occasions. After a few days' withdrawal of plasmochin the drug was recommenced with no recurrence of pain or dysentery.

Thus, as far as our small series goes, in the treatment of relapsing benign tertian malaria, plasmochin has appeared to compare favourably both as regards its immediate therapeutic action (see Table III), and final effect on the relapse rate with other drugs tested during the year, and has even survived the "acid test" of comparison with quinine in both

TABLE III.—COMPARISON OF IMMEDIATE THERAPEUTIC RESULTS (ABSTRACTED FROM CHARTS).

Daily dose	0 hour			24 hours			36 hours			48 hours			Relapse (to date)
	T.	S.	P.	T.	S.	P.	T.	S.	P.	T.	S.	P.	
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
1. Plasmochin, 0·06 grm; quinine, 20 gr. .. .. (15 cases)	100	26·6	86·6	13·3	20·0	40·0	0·0	21·4	0·0	0 0	20·0	0·0	0·0
2. Plasmochin, 0·04 grm.; quinine, 20 gr. daily .. .. .. (36 cases)	62·5	34·4	100·0	28·1	34·4	34·4	3·1	34·4	3·1	0·0	15·6	0·0	5·9
3. Plasmochin, 0·03 grm. (intramuscular); quinine, 10 gr. .. .. (6 cases)	33·3	66·6	100·0	66·6	50·0	83·3	0·0	66·6	0·0	0·0	66·6	0·0	0·0
4. Quinine sulph., 30 gr. daily .. (38 cases)	84·2	30·6	100·0	28·9	34·2	51·4	7·9	28·9	5·4	3·2	9·6	0 0	44·7
5. Quinine parosan oxide, 9 tablets daily .. .. (13 cases)	69·3	23·1	100·0	69·3	23·1	69·3	15·4	23·1	46·2	18·2	18·2	45·4	50·0
6. Parosan oxide, 9 tablets daily .. (6 cases)	16 6	50·0	100·0	33·3	50·0	66·6	16·6	50·0	50·0	0·0	50·0	16·6	50·0

Explanation of Table:—

Under T., S. and P. are shown the percentages of cases under the various treatments exhibiting rise of temperature (T.), enlarged spleen (S.) and parasites in peripheral blood (P.) on day of commencing treatment (0 hours), 24, 36 and 48 hours after commencing treatment.

N.B.—All have completed their 8 weeks' observation period with the exception of those on treatment "2" (plasmochin, 0·04 grm., etc.), only about two-thirds of whom have completed the 8 weeks. On this account the final relapse rate for this series will probably be higher than that now recorded (5·9 per cent).

Treatment 1. Only 6 completed 21 days' course of plasmochin and quinine—remainder received quinine sulph., 30 gr. daily to complete 21 days. (Reasons and exact data given in clinical report for June and July, 1928.)

Treatments 2 and 4. 21 days course completed.

Treatment 3. Plasmochin and quinine as above for 6 days followed by quinine sulph., 20 gr. for 8 days.

Treatments 5 and 6. 14 days' course as above.

these respects. One is chary of attaching too much importance to conclusions drawn from a small series of cases such as the above, but at the worst our results have appeared sufficiently promising to justify a prolonged "try out" of plasmochin next year when it is hoped that a sufficiency of cases will be forthcoming to prove or disprove the merits of the drug once and for all.

As noted above our best series to date has been that treated with a small daily dosage of 0·04 gramme plasmochin in conjunction with quinine for a period of twenty-one days.

This daily dose is probably the therapeutic minimum, but it remains to be seen if a shorter total period of treatment, say fourteen days, would not be equally efficacious.

TABLE IV.—EFFECT OF PLASMOCHIN (0.04 GRM. DAILY FOR TWENTY-ONE DAYS) ON (1) HÆMOGLOBIN PERCENTAGE. (2) WEIGHT.

Case No.	Hæmoglobin on commencement of treatment Per cent	Hæmoglobin on completion Per cent	Gain or loss in hæmoglobin Per cent	Gain or loss in weight lb.
Case 1	84	94	+10	+ 2
,, 2	88	91	+ 3	+ 2
,, 3	76	81	+ 5	+ 3
,, 4	81	88	+ 7	− 4
,, 5	84	85	+ 1	+ 1
,, 6	80	84	+ 4	+ 1
,, 7	81	89	+ 8	+ 4
,, 8	76	81	+ 5	− 2
,, 9	70	98	+28	+ 5
,, 10	85	92	+ 7	− 3
,, 11	83	88	+ 5	+ 2
,, 12	89	91	+ 2	− 1
,, 13	71	87	+16	+ 4
,, 14	70	76	+ 6	+ 6
,, 15	84	99	+15	− 1
,, 16	80	83	+ 3	+ 3
,, 17	73	99	+26	+ 1
,, 18	83	84	+ 1	− 2
,, 19	69	88	+19	+ 2
,, 20	73	88	+15	+ 0
,, 21	77	96	+19	− 1
,, 22	81	88	+ 7	− 1
,, 23	76	84	+ 8	− 3
,, 24	62	76	+14	+ 2
,, 25	76	87	+11	+ 2
,, 26	74	88	+14	− 2
,, 27	71	95	+24	+ 3
,, 28	73	85	+12	− 2
,, 29	74	75	+ 1	− 4
Average (29 cases)	**77**	**87**	**+10**	**+0·59**

Our experience during the two past years (1927, 1928) suggests that a continued course of plasmochin is more efficacious as regards the relapse rate, and, in the small dose of 0·04 gramme daily, not more toxic than the interrupted course previously recommended.

In fairness it must be noted that there is a possible fallacy in judging the effect on the relapse rate of the last series of plasmochin cases. The greater number of these cases were under treatment during September,

October and November, during which months the relapse rate following any line of treatment tends to be less, even in a non-endemic region such as this, than during the monsoon months.

In considering the effect of plasmochin on the relapse rate as compared with the other drugs under review, one must, I think, give due weight to the fact that the drug has been largely tried in the treatment of cases that have already relapsed after treatment at the centre with other remedies (mostly quinine). In such cases one has been led by one's past experience to expect a high subsequent relapse rate. That the relapse rate after plasmochin has remained low in spite of this factor must be put down to the credit of the drug.

The hæmoglobin percentages of a series of patients under treatment with plasmochin taken at the commencement and on completion of their course together with any gain or loss in weight whilst under treatment are shown in Table IV, whilst in Table V plasmochin is compared in these respects with other drugs under trial.

TABLE V.—COMPARISON OF (1) AVERAGE GAIN OR LOSS IN HÆMOGLOBIN PERCENTAGE. (2) AVERAGE GAIN OR LOSS IN WEIGHT AS A RESULT OF TREATMENT WITH UNDER-MENTIONED DRUGS.

Treatment	Average gain or loss in hæmoglobin Per cent	Average gain or loss in weight lb.
1. Plasmochin 0.04 grm., quinine 20 gr., daily for 21 days. (29 cases)	+10	+0·59
2. Quinine sulph., 10 gr. t.d.s. for 21 days. (8 cases)	+ 7	−0·66
3. Quinine parosan oxide tablets, 9 daily for 14 days. (13 cases)	+ 6·4	+0·23

N.B.—The series is too small, with the possible exception of the "plasmochin" group, to be of any statistical value. The chart shows the immediate therapeutic value of various test treatments.

TABLE VI.—SHOWING WEEKLY GAIN OR LOSS OF HÆMOGLOBIN PERCENTAGE ON LIVER DIET (8 OZ. DAILY).

Case No.	Initial hæmoglobin Per cent	1st week Per cent	2nd week Per cent	3rd week Per cent	4th week Per cent	5th week Per cent	6th week Per cent	7th week Per cent
Case 1	59	58	67	56·2	56·2	59	56	56
,, 2	69	—	77	87·0	81·0	83	81	88
,, 3	67	—	83	80·0	76·0	78	80	85
,, 4	69	—	78	78·0	80·0	78	76	86
,, 5	69	—	—	74·0	81·0	81	78	87
,, 6	66	—	70	—	77·0	87	87	87
,, 7	71	—	70	70·0	74·0	81	80	74
,, 8	67	78	78	87·0	80·0	101	91	84
,, 9	74	74	76	81·0	96·0	92	83	—
,, 10	66	76	78	94·0	87·0	81	—	—
,, 11	67	87	88	83·0	78·0	88	—	—
,, 12	66	69	71	76·0	76·0	84	81	85
,, 13	69	89	94	80·0	—	—	—	—
,, 14	65	69	76	83·0	83·0	88	—	—
,, 15	56	85	81	81·0	81·0	88	—	—
Average gain or loss		+12	+2	+2·5	+0·0	+4·8	−3·0	+3·0

Average gain in 7 weeks, 16 per cent.

Case 1 was later found to be suffering from carcinoma of the rectum and is not included for computing averages.

TABLE VII.—SHOWING WEEKLY GAIN OR LOSS OF HÆMOGLOBIN PERCENTAGE ON IRON AND ARSENIC TONIC TER DIE.

Case No.	Initial hæmoglobin Per cent	1st week Per cent	2nd week Per cent	3rd week Per cent	4th week Per cent
Case 1	74	83	78	78	84
,, 2	74	92	82	94	94
,, 3	70	74	74	84	
,, 4	71	73	74	81	87
,, 5	74	81	77	85	
,, 6	71	78	95		
,, 7	71	73	85		
,, 8	71	83			
,, 9	73	73	73	74	76
,, 10	74	87			
,, 11	74	81			
Average gain or loss on previous week		+ 7·5	+ 3·6	+ 6·3	+ 3 5
Corresponding gain or loss on liver diet (see table)		+12	+ 2	+ 2·5	+ 0·0

Tables VI and VII show the weekly gain in hæmoglobin percentage of two groups of patients on liver diet (eight ounces of cooked liver daily) and on iron and arsenic tonic, respectively. It will be noted that the difference in gain of hæmoglobin between the two groups at the end of a month is trifling, tonic treatment (4 cases) + 12·3, liver diet (13 cases) + 14·2.

The two series are, of course, too small for any reliable comparison between them to be made.

SUMMARY AND CONCLUSIONS.

(1) A definite routine is necessary for the successful testing of new methods of treatment. Each new treatment should be rigidly controlled on the alternating system, by a drug of proved value such as quinine.

(2) The average blood-pressure of a large series of healthy convalescents on arrival at the M.T.C. has averaged 129 to 130 mm. of Hg.

There has been little tendency for the average blood-pressure to alter during a stay of two to three months at the M.T.C.; on the other hand the individual blood-pressure has often shown marked fluctuations when monthly records are taken.

(3) An attack of malaria occurring in an endemic area during the season of mosquito prevalence and separated by a longer interval than six months from a previous attack is probably a *fresh* infection and, in my opinion, in most cases, should be recorded as such.

(4) True cachexia is uncommon amongst malaria convalescents (British) who have received adequate treatment for previous relapses.

In the event of a marked degree of anæmia (with or without splenic enlargement), a prolonged search for some cause of the condition other than malaria should be made.

(5) Plasmochin in small dosage (0·04 gramme daily) given continuously for twenty-one days in conjunction with quinine is the best treatment so far tested for benign tertian malaria as regards :—

(i) Immediate therapeutic action.
(ii) Effect on the relapse rate.
(iii) Effect on the general health.

(6) The margin of safety between the therapeutic and toxic doses of plasmochin is dangerously narrow, and whilst in the minimal daily dosage of 0·04 gramme the drug appears safe *under expert supervision* it is considered that the series so far treated is too small to allow of positive conclusions being arrived at, and it is not yet safe for plasmochin to be issued for general use until a further series of cases has been investigated. In any case expert *daily* supervision is essential in the case of patients undergoing treatment with any form of plasmochin, a watchful eye being kept for toxic symptoms and the drug temporarily withdrawn on their appearance.

(7) Liver diet has no striking curative action on anæmia associated with malaria.

The greater part of this article deals with methods of treatment and their scientific control, which was first adopted in this Centre by Major Sinton.

My thanks are due to Assistant Surgeon Cabral, I.M.D., and Sub-Assistant Surgeon Diwan Chand, the latter of whom was responsible for all routine blood examination and hæmoglobin estimations—no light task.

My thanks are also due to Lieutenant-Colonel P. C. T. Davy, C.M.G., R.A.M.C., for permission to publish this somewhat lengthy paper, dealing with cases under treatment at the Hospital under his command, and to the Medical Directorate, Army Headquarters, Simla, for the extensive use that I have made of the monthly reports submitted to them.

REFERENCE.

[1] *Indian Journal of Medical Research*, vol. xvi, No. 1, July, 1925.

RANDOM JOTTINGS ON THE TRAINING OF THE R.A.M.C.

By Lieutenant-Colonel G. A. K. H. REED,
Royal Army Medical Corps.

(Continued from p. 102.)

IV.—Field Training.

When the men are proficient in carrying out these movements as a drill, extending, closing, halting, lying down, etc., passing whispered orders correctly, and keeping their interval and direction accurately by order and signal, the next step is to apply these principles to work over actual country with wide intervals.

Pains must be taken to develop the initiative of the Nos. 1, as a squad must always be looked upon as a semi-independent unit.

It should be impressed on all that their work is to give first aid and collect wounded and that the formations practised are only intended to facilitate control and the keeping of direction and are *not* to be blindly adhered to by individual squads under all circumstances.

(1) For instance if a squad in the first extension is confronted with thick cover or broken ground it should assume the second extension in order to search the cover, re-assuming first extension when clear.

(2) The fact that a squad has been ordered to "halt" should not prevent the bearers from searching neighbouring cover—they must however keep touch with squads on right or left while so doing.

(3) The fact that squads are ordered to "advance" should not prevent them in carrying out first aid or in passing information about the presence of casualties. Should these be numerous it is possible that order to advance would be cancelled for the whole formation on information being passed along.

[1] *Men should be trained when halted to lie down and take cover* on their own initiative, always remembering to search round for wounded. Parade movements should be eliminated as far as possible as soon as the principles have been mastered.

Squads should automatically increase their extension laterally and bridge a gap caused by a squad halting to attend to casualties and close again if squad rejoins. All casualties found should be reported at once to the Commander.

It is recognized that when practising over difficult country, as soon as casualties are met the formation may become broken up and lateral com-

[1] i.e., squad or squads finding a "dump" or several wounded would signal to squads on each side to close in and help, and pass the word to the officer.

munication interrupted. Under these circumstances the Nos. 1, should make every effort to re-establish touch by putting out a "look-out" man and taking up new landmarks so as to preserve correct direction.

The taking up of landmarks by all bearers during an advance will also assist a squad to rejoin its formation.

As a general principle first aid and grouping is carried out during the advance, the carriage of stretcher cases being left for the return journey, as otherwise delay in giving first aid to cases may occur.

Sometimes two companies may work in echelon, the leading company grouping and the other company carrying patients back.

Very strict liaison between the two companies is necessary.

It is advantageous to divide the area to be searched into zones parallel with the front, the boundaries being easily recognized ridges or other landmarks. Squads should be instructed to halt on their own when reaching the limit of a zone. When the point is reached squads may either be advanced into the next zone by order or retired, carrying back casualties already grouped in the first zone.

Further details of instructional methods are given in the Scheme of Training, Appendix I.

Junior officers and N.C.O.'s should be instructed in the principles of reconnaissance in order to find the best line for the advance and in the art of explaining clearly to their men exactly what is required before deploying to search for wounded. They must have a knowledge of the elements of visual training, compass work and the clock and finger methods of describing points on a landscape.

A working knowledge of map reading is also necessary, especially the different methods of "setting" a map, finding a position and recognizing points on a map.

REFERENCES.

Royal Army Medical Corps Training.
Field Service Regulations.
Infantry Training.
The Musketry Regulations.

V.—EPILOGUE.

There are twelve "Trades" in the Royal Army Medical Corps, let us have a thirteenth (*absit omen!*) known as "Trained Stretcher Bearer." He should be of good physique, a "handyman," with a Second Class Certificate of Education, though not necessarily a man of letters, an out-of-door man with plenty of initiative and a fair instructor with a working knowledge of the subjects touched upon above and an "eye for country." He should be of course an N.O.iii. The trained stretcher-bearer would also be required to have a really thorough *practical* knowledge of first aid and for this purpose would have to pass a searching examination in this subject much above the present standard, and including a working know-

ledge of the contents of the "bearers' cart," method of loading the transport of a field ambulance company, etc. How many should there be? I suggest 57 for a start, i.e., 4 divisions × 3 field ambulances × 2 companies × 2 + 10 per cent. spare. On mobilization the field ambulances would be brought up to strength by a large number of partly-trained men. The "specialists" would be in the H.Q. and "A.D.S. party" of the field ambulance, therefore the partly-trained men would largely be stretcher-bearers. They require instruction at short notice. In peace time the "trained stretcher-bearer" would be employed on the permanent staff of the depot and in the company offices of hospital companies and in the "casualty theatre," etc. As the work of field ambulances in collecting wounded becomes more and more difficult so will the need of such men become apparent. They cannot be made in a moment.

APPENDIX I.

SCHEDULE SCHEME OF TRAINING.

I. Practice in control by whistles and signals.

II. Demonstrations on the military vocabulary, use of landmarks, etc.

III. Drill in first and second extensions, with wide intervals (see Part III); control by signal or order passed down.

IV. Individual squad practices: based on the methods of instruction in force at the School of Musketry, Hythe.

(*a*) Points to be touched in preliminary lectures.
Hints to be noted when collecting wounded under fire.

(*b*) Practical exercises which can be carried out on the parade ground.

(1) Squads under fire [1] advancing in second extension.
(2) Squads under fire [1]—casualties to be brought back at once.
(3) Squad not under rifle fire.[1]
(4) Practice in removing wounded from a ridge or exposed position, squads not having to advance further.
(5) Squads advancing under rifle fire [1] with exposed ridge in front, squads being required to advance beyond ridge.

V. Collective bearer section practice over actual country—open at first, later broken and wooded, with "casualties" scattered about.

VI. (*a*) Practice in evacuating wounded down trenches and over obstacles, and the use of the trench stretcher.

(*b*) Demonstration of a modern trench system, with Regimental Aid Posts and Field Ambulance Collecting Posts.

VII. Practice in loading lorries, trains, etc.

VIII. March discipline and route marches

IX. Practice in loading and unloading "bearers cart." (No. 1 Limbered G. S. Wagon.)

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[1] The term "fire" means liability to unaimed and casual firing.

SCHEME OF TRAINING IN DETAIL.

I. Practice in Control by Whistle and Signals. (The signals, with one addition, are those described in infantry training, q.v.a.) *Commencing in close order*; halting, advancing, changing direction, retiring, lying down, etc., by whistle and signal (as laid down in Infantry Training), until all can make and recognize signals (see Appendix II).

II. Demonstrations in the Military Vocabulary (use of terms *spur, crest, salient, glacis, neck,* etc.): The recognized methods of visual training, description of landscape ("description points," and the clock and finger method); the use of landmarks and methods of keeping a true direction across country; use of cover and dead ground, etc.

III. Drill in First and Second Extension with moderate intervals: Extending, closing, changing directions, by whistle, signal, or order passed down. Short distances up to 100 yards to be demonstrated when in extended order: Squads lower stretchers and stand easy when ordered to halt; squads to lift stretchers when ordered to advance. The object being to cut out unnecessary commands when in extended order.

Practice in correct direction and interval, squads extending to bridge gap caused by another squad falling out to see to casualties and resuming previous extension when squad rejoins, squads closing in to aid one another if a "group" of casualties is found, etc.

IV. Individual Squad Practices designed to train the Nos. 1 to use their own initiative when working in the field and dealing with casualties on the following lines. Gas masks should be worn in some of the practices or an alarm of "Gas" raised during a practice.

A.—*Points to be Touched in Preliminary Lectures.*

Responsibility of No. 1 for the control of his own squad: He should, when necessary, whilst acting in accordance with the general idea, vary the formation to suit a local situation. For instance, suppose the bearer section to be advancing in first extension, and No. 1 finds that his line of advance leads through woods or broken ground where casualties may be hidden, he should adopt second extension for his own squad, and then, if necessary, resume first extension when clear. He should assign to each bearer in his squad particular duties as follows: When in the second extension, Nos. 2 and 4 carry the stretcher and help No. 1 to dress severe cases. Nos. 2 and 4 should always keep in touch with No. 1 unless ordered to the contrary. No. 3 searches neighbourhood, dressing trivial casualties, and draws attention of No. 1 to serious ones: in addition, No. 3 should keep in touch with squads on the right, and No. 1 with squads on left. For instance, when a squad finds casualties and halts to deal with them, the bearer finding a serious case will call up the No. 1, who will take over and treat it with the help of Nos. 2 and 4. The squad should not lose touch with its No. 1 and should be within signal range of him. Bearers, when not actually dealing with a case, will keep a constant look-out and observe

direction taken by squads on their right and left so that correct direction may be kept at all times, they will also observe their direction marks.

When all casualties in the neighbourhood have been dressed, No. 1 will give the signal or order to advance again. When squad resumes its advance, No. 1 will be responsible for the direction on the left, and No. 3 for that on the right flank—in this way touch can be regained with other squads, the original landmark being kept in mind. If the original landmark falls out of sight a fresh one in the same line will be taken.

N.B.—Should the casualties be more than this squad can deal with, No. 1 should call neighbouring squads to his help by signal "to close" or by messenger.

Hints to be noted when treating and collecting wounded under fire.

(1) Stop arterial hæmorrhage if present with finger pressure or pad.

(2) Get case under cover quickly with minimum exposure to case and squad.

(3) Apply first aid, including tourniquet if necessary.

(4) Only minimum number of bearers necessary should approach patient.

(5) First aid to be given in prone position if no cover near. Never bunch round patient when under fire.

(6) Reserve the stretcher for serious cases.

(7) Do not cross sky-line unless absolutely necessary; if it has to be done, double, choose a part with bushes or cover in preference to a bare bit of ground.

(8) If an exposed bit of ground lies in front with no casualties in it, skirt round it; if doubtful, send one bearer to explore it.

Wounded men come under one of four groups :

(1) Cases able to get back after being dressed, without assistance. These should be directed to W.W.C.P. or A.D.S.

(2) Cases able to walk with assistance of one or more bearers.

(3) Cases requiring stretcher carriage, if carry is long use the four bearers.

(4) Cases which must not be moved. Give examples of each.

During a retreat if all casualties cannot be got away, the most seriously injured should be left behind under shelter. Medical personnel should not stay with them unless ordered to do so.

Absolute necessity of liaison with Brigade H.Q. by telephone, signal message or runners; with R.A.P.'s by means of runners or a stretcher squad previously attached to each and *with A.D.S.* by messages sent by ambulance drivers or returning wounded, officers or N.C.O.'s.

If this liaison is not established, the whole scheme of evacuation may fall through.

Importance of using wheeled stretchers if a track exists, especially with the 2nd Echelon of a relay.

Necessity of organizing "car posts" as far forward as is consistent with reasonable safety in order to shorten hand carriage.

Field ambulance bearers should not be rushed up to a captured position if a counter attack is imminent, they will only get in the way and get shot. Wait until counter-attack has been dealt with.

The fact that a medical post is sited (by map) at a certain spot does not necessarily mean that it should be put there, the spot may be unsuitable, a directing flag should be placed on the spot and the post established in a *suitable* locality as near as possible.

B.--Practical exercises which can be carried out on the parade ground.

Stand the squads easy, and, taking each squad separately, make it collect a "casualty" under different conditions, No. 1 to control. Remaining squads to watch carefully. When each squad has completed its practice, ask Nos. 1 of the other squads to criticize what has been done, and get No. 1 of the squad which has carried out the practice to explain the action he has taken. Criticize the exercise yourself, and make the squads repeat correctly. When criticizing, emphasize important points such as: stop hæmorrhage by finger—get under cover before dressing, if under fire—only minimum number of men required to approach case—use of cover—dead ground, etc.

This is the system in use at the School of Musketry, Hythe.

In order to impress on the men the importance of these rules, make casualties of all those bearers who expose themselves unnecessarily. The squads should always collect wounded in second extension if under risk of rifle or machine-gun indirect fire.

If a squad is seen by the enemy it may be fired on. Four men round a stretcher make a big target.

(1) *Situation* 1. *Squads or squad under fire advancing in second extension.*

The squad to be considered as a part of a bearer company. A casualty is found by one of the supernumerary bearers who hands the case over to No. 1. If case is severe, No. 1 will give signal to halt and dress the case with the help of Nos. 2 and 4, remaining bearers quarter the neighbourhood and look for other wounded, dressing slight cases and calling the attention of No. 1 to severe cases. When all the casualties are dressed, the squad continues its advance, the Nos. 3 and 1 re-establishing touch (leaving case to be carried back on return journey if so ordered).

(2) *Situation* 2. *Squads or squad under rifle fire. Casualties to be brought back at once.*

Squads act as in (1), but when casualty is dressed the No. 1 loads the stretcher with the help of Nos. 2 and 4, and retires his squad in second extension formation, making use of all available cover.

When squad is no longer exposed it may assume first extension.

(3) *Situation* 3. *Squads not under rifle fire. Otherwise as in* (2), *but distance to wagons long.*

No. 1 acts as in (2), but closes his squad in and then retires in first

extension formation, so that bearers can relieve one another or carry by the "shoulder" method.

(4) *Practice in removing wounded from a ridge or exposed position, it being understood that the squads will not have to advance further.*

No. 1 halts his men under cover and gives signal to lie down; just short of the ridge and under cover. He then advances with one other man, making full use of all cover, and assuming a prone position, draws the "casualty" into dead ground, etc., where it is loaded on stretcher and carried back.

N.B.—The above can be made collective practice with two or more squads on the parade ground—the "ridge" being imaginary.

(5) *Squad advancing under "rifle fire" with exposed ridge in front, squad being required to advance beyond ridge after dealing with casualties.*

No. 1 halts his squad, orders them to lie down and then reconnoitres ridge alone, or with another bearer. If wounded are found, he acts as in No. 4. If not, he returns to his squad and causes them to skirt the ridge, using dead ground to a flank, and deploys again when beyond the exposed bit of ground.

V. Collective Bearer Practices should also be carried out on the above lines with several squads or a complete bearer company over actual country if possible.

The piece of ground selected should be at least 600 yards square for the exercise of one company (nine stretcher squads). Casualties in the proportion of at least three per squad should be detailed, one per squad at least being a severe case requiring carriage. Collecting posts or car posts and regimental aid posts (imaginary if necessary) should be formed, and should be advanced and retired from time to time. Inter-communication and direction are the points to be stressed.

Before practising the search for "casualties," the bearer section or division should be halted in close order at the advanced dressing station, collecting post, or other jumping-off point—under cover.

Practice in assuming stretcher squad formation from column of fours and vice versa is essential to avoid loss of time.

The instructor should fall out the officers, N.C.O.'s and Nos. 1 and explain the scheme to them in detail, and, if possible, point out to them the sector of the country which they are to work. Landmarks and "descriptive points" should be indicated by the "clock and finger" method, and the importance of inter-communication and direction again emphasized. Special attention should be given to the points touched on under "Field Training" and lessons learnt by previous squad practices.

The N.C.O.'s and Nos. 1 should then rejoin their men and explain the situation to them. In early practices it might be advisable for the instructor to explain to all ranks himself. In any case he should carefully check

mistakes made in the explanations by the N.C.O.'s and Nos. 1 until latter are proficient.

Before deploying, touch should previously have been established, if possible, with R.A.P.'s by means of bearers previously attached to them who will carry back first casualties and act as guides.

If casualties have been detailed it should be decided whether they are to be (*a*) brought in at once as soon as found or (*b*) "grouped," given first aid, and the advance continued.

This depends on: (1) The nature of the action which is taking place in front; (2) the conformation of the country, i.e., if good cover for groups of casualties exists or if there are good roads or tracks along which wheeled transport may be brought later; (3) the distance to be traversed and the feasibility of dividing into zones; (4) the number of casualties and their nature if known approximately.

The country chosen should be fairly easy in initial practices but later difficult broken country should be used and searching at night practised, direction being by compass bearing.

The interactions of two "companies" in echelon connected by a relay post or posts should be practised.

The leading company doing first aid and grouping and informing the rear company of positions of groups and numbers of wounded and the rear company carrying back casualties to the car post.

As a rule a squad should not be required to carry a case more than 500 to 600 yards—if distance is longer relays must be arranged.

VI. DEMONSTRATION OF A MODERN TRENCH SYSTEM with regimental aid posts and field ambulance collecting posts. Models may be used.

VII. PRACTICE IN EVACUATING WOUNDED DOWN TRENCHES and over obstacles.

Practice in loading lorries, ambulance trains, barges, etc., when possible.

VIII. PRACTICAL INSTRUCTION IN MARCH DISCIPLINE BY ROUTE MARCHES.

Falling in in fours, or in stretcher formation by whistle, moving off by signal, falling out on left of road by whistle and signal. Water discipline on the march, etc.

IX. METHOD OF LOADING AND UNLOADING NO. 1 LIMBERED G. S. WAGON ("bearer's cart"), practice in dumping packs and drawing stretchers, splints, surgical and shell dressings, haversacks, and vice versa.

APPENDIX II.

LIST OF SIGNALS USED IN THE SCHEME.

(*All are officially recognized in Infantry Training except No* 7.)

1. "ADVANCE" ... ... Arm swung forward as in under-arm bowling, palm to the front.
2. "HALT" ... ... Arm raised straight above head.

3. "RETIRE"	Arm and hand describes a small circle above head several times.
4. "DOUBLE"	Arm with fist clenched raised up and down several times between shoulder and waist.
5. "LIE DOWN"	Arm with palm directed downwards raised and lowered several times between waist and knee as if patting the ground.
6. "EXTEND"	(First Extension). Arm raised above head, and swung pendulum fashion from side to side. Arm is then pointed in direction towards which extension is to be made.
7. "SECOND EXTENSION" ... (Special signal not in Infantry Training)	Both arms stretched forward horizontally, palms together and then separated and swung back in line with shoulders as in the "breast stroke" in swimming. The signal to re-assume "first extension" from "second extension" is the reverse of above.
8. "CLOSE"	Palm of the hand placed flat on the top of head and arm then pointed in direction towards which closing should take place.
9. "INCLINE"	Arm raised horizontally and fingers pointed in required direction.
10. "CHANGE DIRECTION" ...	Arm held horizontally with hand pointing towards *present* direction and then swung horizontally to *new* direction required.

11. *The Whistle is used* :—

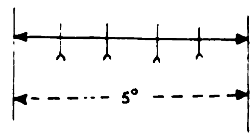
1. To call attention to an order or signal—on a short blast being given all look towards the instructor. This is followed by the order or signal.

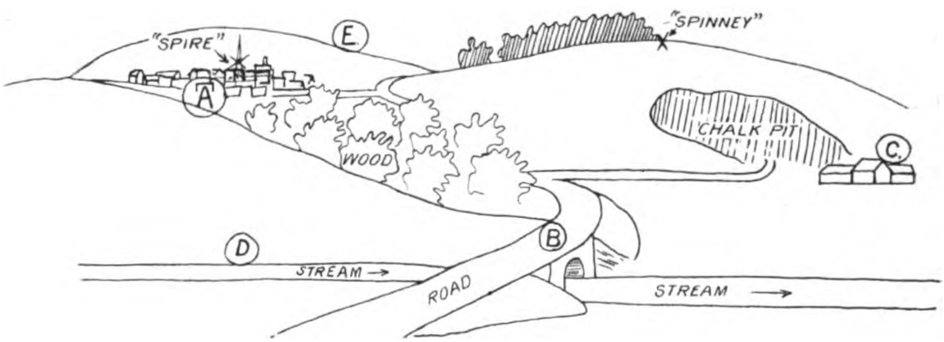
2. To denote "fall in"—A series of short blasts preceded by one long blast for "A Company," two long blasts for "B Company" and three long blasts for "Headquarters."

APPENDIX III.

DIAGRAM SHOWING THE "CLOCK AND FINGER" METHOD OF DESCRIBING LANDMARKS. (MODIFIED FROM INFANTRY TRAINING.)

Presumed width of hand and fingers when held at arm's length for use with diagram.





Prominent landmarks not more than 10° apart (the width of two hands held at arm's length) are used as description points, i.e., "church spire" (lowest visible part of spire) and "spinney" (the lowest part of right edge of a wood on the hill).

With these description points representing the centre of a clock face any object on the landscape can be pointed out in terms of the hour and distance from the description point in finger breadths (degrees) given. Thus:—

House at "A"	=	"Spire—one finger—eight o'clock—a house."
Bridge at "B"	=	"Spinney—five fingers—seven o'clock—a bridge."
House at "C"	=	"Spinney—five fingers—four o'clock—a house."
Point "D"	=	"Spire—four fingers—six o'clock."
Point "E"	=	"Spire—two fingers—two o'clock."

This method need not be used for obvious points such as the "bridge," etc., on sketch. The sketch is only explanatory.

SOME ANSWERS TO THE CANTONMENT ANTIMALARIA PROBLEM.

By Major R. A. MANSELL, M.B.E.
Royal Army Medical Corps.

Major T. O. Thompson, in his article on "The Cantonment Antimalaria Problem" in the Journal for September, 1928, asks questions. Except that in so doing I perhaps condemn myself the more thoroughly, I would hesitate to quote Mr. Augustine Birrell, who once wrote that "Nothing can well be more offensive than the abrupt asking of questions, unless it be the glib assurance which professes to be able to answer them without a moment's doubt or hesitation." The objection to the asker of questions is that he, more often than not, brings us face to face with the stone wall of reason. In so doing in relation to one of the most important problems of the military hygienist in India Major Thompson has performed a service. The reasons for our actions are so often those of other people that at times we must appreciate the opportunity of self-defence or of admitting the validity of the criticism.

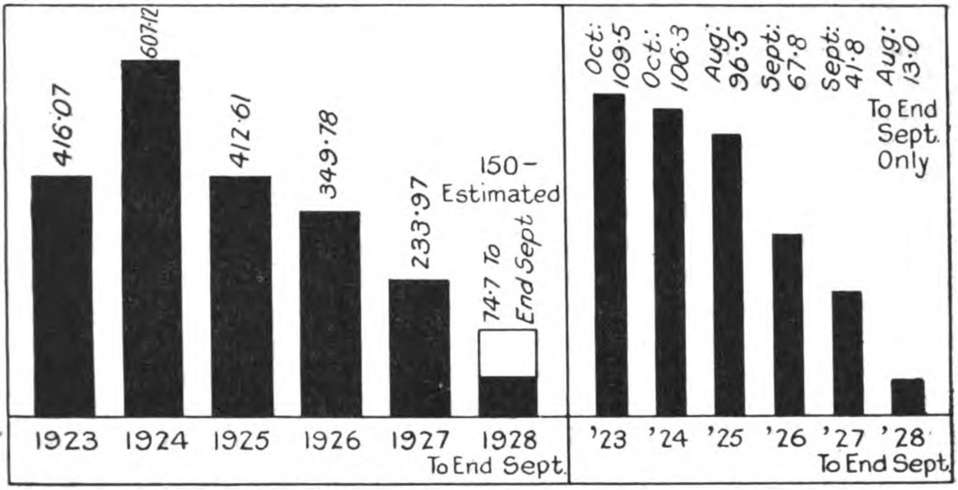
Much that I have to say in answer to Major Thompson's question is, I know, both provocative and debatable. Such of it as I have put down here, though possibly dogmatic in form, is not intended to be other than in friendly debate. We are constantly bidden to avoid the use of indefinite terms, and, though dealing with certain aspects of a subject, of the knowledge of which we are only yet invading the outer limits, I have tried to apply facts—and fancies—in a definite manner in defence of a policy which appears to have been attacked by a multi-headed hydra of doubt, and, too, to infuse a little optimism in place of the pessimistic answers which might obviously be given to the questions asked.

(1) *The Shape of our Localities.*—The answer must be, regarding this particular problem, that as yet we have no firm grounds on which scientifically to base our reply. Generally speaking, we know already that special areas, large or small, which are more or less isolated, can be adequately controlled, and malaria can be either eradicated from them or reduced to an inconsiderable, or at least non-crippling, factor. We, however, as military hygienists in India, are trying to deal with some seventy scattered cantonments in the midst of endemic malarial areas. The average area of each of these cantonments will be, say, some ten square miles. Recent work in Italy has shown that active anti-larval measures are required to be carried three kilometres outside the boundaries of the area which is to be freed from malarial scourge—say one and three-quarter miles at least: this brings the necessary area of our activities for the average cantonment

to some twenty odd square miles of country, over more than half of which we usually exercise little or no control. With malaria, however, as with other infective diseases, productive preventive work must begin at the centre and spread outwards. Though in some places we have been able to obtain some degree of control in extra-cantonment areas, the essential first step is to set our own houses in order.

Of recent years sums rising to two lakhs of rupees annually have been allotted in the Army budgets for anti-malaria work in cantonments of the anti-larval and anti-adult types. The apex of the curve of annual hospital admissions for malaria of all kinds amongst British troops in one of the most malarious districts of the north of India has fallen definitely and rapidly since the institution of this expenditure. I believe that the experience of this district has not been unique. This fall is summarized in the histograms printed below.

BRITISH TROOPS—MALARIA.



Admissions to hospital, per thousand per annum. Maximum monthly admissions per thousand.

A bold man will say, at once, that the proof of the pudding is in the eating: a more cautious one will reply that though gastronomically gratified he prefers to withhold his final pronouncement till the processes of digestion have confirmed the appreciation of his palate.

We do not know with what we are dealing. We have no criteria by which we can confidently affirm that we are dealing with a man-made, and not a natural, phenomenon. Statistics for the civil population in India are necessarily open to so many difficulties that they cannot help us; military statistics prior to a date just after the termination of the Great War are influenced by so many variable factors that we have no accurate and unassailable grounds for claiming that the decline of the hospital admission

rates over the past six years is *entirely* the result of the attack directed by the hygienists. The next few years may see us uncontrollably on the up grade or suddenly faced with a massive epidemic outbreak determined by natural and economic causes beyond our influence.

If we are rash enough to claim the whole of the results shown graphically above, we can place, for one district alone, a saving of 3,287 admissions of British and 1908 Indian troops to hospital against an expenditure, over four years, of some 1½ lakhs of rupees. Take each admission as remaining, say, a week in hospital, this represents a saving of 23,000 British and 13,300 Indian men-days. (I am calculating the final result of this year's malarial infections, perhaps very rashly, though at the time of writing there is no special indication of anything unusual happening, on an average basis so as to be comparable with the combined results of the previous five years, wherein one half of the admissions for malaria for the year took place in the period January-September and one half in the period October-December; the actual figures are available only to the end of September.)

If, perhaps more reasonably, we ascribe this downward tendency to a combination of meteorological influences and an epidemiological periodicity and claim even a small fraction only as the result of our efforts, we have nothing worthy of serious consideration, to say the least.

Scientifically, we are at the beginning of our experiment, and, to be rational, we must continue it to the end, provided we are convinced that it is not harmful and that we have nothing more certainly beneficial—and Major Thompson suggests nothing—to put in its place. In continuing this work we shall maintain and increase popular interest and education in anti-malaria work, remembering the dictum of an American malariologist, that "Malaria perpetuates ignorance, and ignorance perpetuates malaria," and we shall set an example before our civil colleagues. In some future year it will be realized, even throughout India, that, as Disraeli said when introducing the first Public Health Bill in England in 1875, "the first consideration of a Minister should be the health of the people." Then we shall have with us the co-operation which will cover the edges of our now local intra-cantonment efforts.

Major Thompson may disagree with me when I say that he suggests nothing to take the place of our present anti-malaria work and point to his remarks anent mosquito-proofing. I will return to these later, and here just mention the "cold storage" alternative.

The "cold storage" of British troops in non-malarious hill stations during the hot weather sounds as if it were the solution of our troubles. Facts, however, are stern masters: the numbers of men who actually escape from the possibilities of malarial infection in this way range—in my experience—from one-third to two-thirds of the total. Considerations of internal security and accommodation rule out the remainder. Furthermore a considerable part of the value of this measure is apt to be lost by reason of the necessity which is urged for the return of troops to the

plains for training as early as possible in October, often an intensely malarious season in the Punjab. The actual effects of "cold storage" in the reduction of the incidence of malaria, as practised, are apt to be overestimated.

(2) *The Formation of Breeding Places.*—We cannot abolish the buffalo, and his wallow will remain with him: we cannot do without the M.E.S. and the P.W.D., and their borrow pits will continue to be made. But we can induce both of these classes to create such breeding places as they must in restricted areas which we know and with which we can deal in a routine manner. This takes time, but it is not unachievably difficult, nor is the anti-larval treatment of a known pit or area anything outside our ordinary work.

(3) *Ignorance.*—Along with the depressing ignorance of our own "upper classes" one does meet, not infrequently, refreshing knowledge and keenness amongst soldiers and sepoys and, indeed, followers. This will spread: the East is slow and, without disparaging our predecessors, we have not been trying really to educate it in these matters for very long yet. Deputy Commissioners, rightly handled, will gather together Lambardars for lectures and demonstrations on malaria and its prevention. The employment of sepoys on supervising antimalaria work, with demonstrations of the results achieved by actual statistics, and the employment of the children of Indian Hospital Corps personnel and followers in special branches of that work, will slowly spread knowledge through the villages of India in the same way that the taking of his mosquito net with him on leave by the sepoy is getting beyond the stage of ridicule to that of trial by his relatives.

(4) *The Use and Abuse of Oils.*—The uses, and with them the abuses, of oils will, I am rapidly becoming convinced, decrease as soon as the advantages of Paris green become appreciated, and will remain only for the local destruction of culicine vectors where these carry disease. Paris green is clean, easy to manipulate, open to no objections by the cultivator or the herdsman, and is effective.

(5) *The Use of Filling.*—In our Cantonment refuse we have, admittedly, a most valuable filling material which is being used in some stations. But let it be burned first.

(6) *Mosquito Surveys.*—As military officers we are possibly handicapped in the carrying out of mosquito surveys; I will not admit more. But this year one district in India has managed to keep its antimalaria officers unchanged throughout the season and at their duties practically uninterruptedly. There are almost always jobs which can be combined with anti-malaria work which allow of ample time for the proper performance of the duties of Cantonment medical officer, charge of a Brigade laboratory, hot weather staff surgeon, and so on.

With regard to surveys in detail—no Cantonment, or other, antimalaria scheme can be carried out without some sort of a survey, and no anti-

malaria scheme that does not envisage the work of several years ahead is worth starting on.

When the officer for antimalaria work has been selected for his capability in getting things done, for his tact in dealing with other branches of the service and for his aptitude for the work, it has been found that, after a short course of instruction in elementary entomology, identification of mosquitoes, the principles of antimalaria operations and the general scheme adopted for the district, he will be able to produce "surveys" which any other similarly qualified officer will be able to understand. In this way the work can be carried on uninterruptedly in accordance with an approved logical plan.

I cannot agree that we shall eventually direct our attacks against species of anophelines. The more knowledge we gather about species and their habits the better; but comparatively little experience is required to appreciate that, for instance, anophelines will not refuse to breed in dirty water at the height of the breeding season, and that several species will breed freely together throughout the season in the same stream or pond—in short, that all water must be suspect, and that though there may be preference there is no specificity.

(7) *The Use of Spot Maps.*—Spot maps are an essential part of any "survey," and of most effective schemes for controlling infective diseases. We must have them, not only by units, but for the station as a whole, if we are to have any co-ordinated system of continuous work. One of the most useful of these is the combined map kept by the antimalaria officer which shows the water areas of various durations, larvæ and adults found, and cases notified, all on the same sheet. Month by month, as he fills this in, he sees his points of immediate attack; and at the end of the year he sees his next year's programme sketched for him.

(8-10) *Fumigation, Spraying, &c.*—Fumigation, by reason of its very dirtiness and of the disturbance caused by it, will disappear. Some (unpublished) experiments by Lt.-Col. J. B. Hanafin, I.M.S., appear to show that it is possible to destroy mosquitoes with from two to five ounces of rapidly vapourized cresol per thousand cubic feet in barrack rooms which have been closed but not sealed.

In essence, the rationale of fumigation depends on the finding of the League of Nations Commission in Europe that anopheline carriers of malaria parasites when infected tend to become house-dwellers, and that they hibernate in dwelling houses during the winter. The anopheline in question was *A. maculipennis*, which does not exist in India. We do not yet know that Indian anophelines have either of these habits; investigations have not yet been completely carried out on these lines. All that we can say is that in India, fumigation or spraying, if properly carried out, will kill—or drive out—insects which happen to be present. As soon as the smell has departed fresh insects will arrive to take their places. In mosquito-proofed barracks periodical spraying or fumigation

should, naturally, be a routine procedure. The use of a high-pressure spraying machine with a cheap, effective insecticide involves the minimum of disturbance of furniture and inhabitants and is bound to replace fumigation if only we can obtain a sufficiently cheap and effective fluid. A solution (devised by Captain K. M. Bharucha, I.M.S.) of forty-eight of the commonly used naphthalene balls in a gallon of paraffin will destroy insects, not quite so rapidly as most of the commercial products, but very much more cheaply : it may be a prescription worth further experimentation.

(11) *Personal Protection.*—We have got beyond the experimental stage in mass protection ; the principle of mosquito-proofing has been accepted by the Government of India: but the mosquito-proofing of a British Infantry barracks costs, I think, in the neighbourhood of 80,000 rupees. Let us be reasonable with the finance department!

As to anti-larval measures, enough has been said to indicate that I, at least—I may be wrong here as often before—do not see our present admittedly limited works as the end, or possible end, of their existence or aim. We have an example to set as well as a (probably limited) benefit to gain. If at the end of ten years we see some few of the results of that example, we shall have worked well for India. Apart from which, it is true that the early Italian experimenters demonstrated the fallacy of the miasm theory of infection by dwelling in a mosquito-proofed house in the Roman marshes : the soldier will not be permanently confined to his barrack room and institute between the hours of sundown and sunrise. A study of any properly kept spot map of anopheline breeding and malarial incidence will demonstrate the immediate value of anti-larval measures within Cantonment limits.

As to personal protection, I can say nothing in answer to the questions asked that has not been better said before, except to refer to an experiment which was recently carried out during a move of troops through a malarious belt of country, the apparent results of which have been recorded in this Journal. (Vol. LII, page 110.)

We are, I think, travelling slowly along the right lines. No one method can be the best for the whole of the country: reliance on one method can but very rarely be good for any one place in the country. But my experience, such as it is, impresses strongly on me that to get any results at all from our work close and continuous personal supervision is essential.

PHLEBOTOMUS FLIES IN MAURITIUS.

By Major W. F. M. LOUGHNAN, M.C.
Royal Army Medical Corps.

In March, 1927, on my arrival here, I systematically examined all the likely places in the military areas for the presence of blood-sucking sand-flies (Phlebotominæ), without success. During my sanitary inspections I continued the search until December, 1928, when the first specimens were captured. From that date the numbers continued to increase, and several sand-flies were caught in January, February, March and April of the present year. The adults were most commonly found during the day in damp, shady, whitewashed and uninhabited barrack rooms situated on the ground floor. In these haunts they were scarcely disturbed by air currents, and the temperature averaged 70° to 80° F.

The number of flies in each barrack room varied considerably from time to time—for instance, during one week sand-flies would be numerous in one room, while a few days later scarcely an insect would be seen in the same place.

Phlebotomus flies were also caught in sparse numbers in cool, shady spots in latrines and bathhouses and amongst clothing in occupied barrack rooms.

In the open a few flies were captured in the debris amongst the suspended roots of banyan trees.

Several specimens were sent to the British Museum (Natural History Section), who kindly examined all the midges and reported them to be *Phlebotomus africanus.*

This is the first authentic record of the occurrence of a species of phlebotomus from Mauritius.

In recent years a great deal of work has been done to simplify the identification of the various species of sand-flies. The discrimination of the females of some of the species has hitherto been extremely difficult and unreliable.

Newstead, working on Maltese sandflies in 1911, divided the species into two groups : (*a*) those in which the hairs on the dorsal segments of the abdomen are erect ; and (*b*) those in which the hairs are recumbent.

Sinton, working in India, has classified the Indian phlebotomus into erect-haired and recumbent-haired types. These can easily be seen with a hand lens ; only females, the blood-sucking sex, are differentiated.

The dorsum of all the abdominal segments posterior to the first is examined for the presence of recumbent or erect hairs.

In the members of the erect-haired group the spermathecæ have a distinct crenated or striated appearance, which is very different from the

smooth, unstriated appearance of these organs in the recumbent-haired group.

Adler and Theodor, working in Palestine on the *minutus* group of the genus Phlebotomus, have demonstrated very important diagnostic points in the morphology of the buccal and pharyngeal structures, namely, the presence of and alignment of the teeth on the posterior part of the floor of the buccal cavity, and a pigmented area on the buccal armature.

Fort George, Line Barracks, Port Louis.

Fort George, Mauritius, where sandflies were first captured in Mauritius, is situated on the Isle aux Tonneliers at the north side of the entrance to Port Louis harbour. Between it and the mainland a shallow sea (the Mer Rouge) intervenes, of which the water averages only a few feet deep. Across this shallow water a causeway, about 700 yards long, connects Fort George with the town of Port Louis.

Isle aux Tonneliers is a small flat island composed of coral debris.

The casemates in Fort George are only one and a half to four feet above the high-water level of the sea.

The Fort is a large one, about twenty acres in extent, and the surrounding ground is now well drained where formerly nothing but marshes existed.

The Fort is surrounded on the land side by a dry moat. The face and sides are well covered with scrub, consisting of cacti, logwood, stunted palms and filioas. The Fort itself is well shaded with banyan, filioas and acacia trees.

Line Barracks, where sand-flies were also caught, is situated nearer the west side of the town of Port Louis, about a quarter of a mile from the harbour, and about fifteen feet above the sea level. The barrack enclosure, which consists of a solid masonry wall about twenty feet high, extends round an area of about twenty acres. The greater part of it is covered with grass. The soil is a heavy clay resting on rock. During the heavy rains the subsoil water is within a few inches of the surface of the ground, and pools of water occur at places. During the dry season the ground becomes hard and cracked.

The houses of the town surround the barracks on all sides.

At present the barracks are not occupied by troops but are loaned to the Mauritius Police Force.

The Climate of Port Louis.

Situated just within the tropics, with no large land masses for many hundreds of miles in any direction, Mauritius enjoys a climate free from any violent extremes of weather, except that tropical cyclones at times cause considerable damage to crops and, more rarely, to buildings.

For the greater part of the year the so-called south-east trade winds

blow gently over the island, tempering the tropical heat. Port Louis, surrounded in the east and south by a ring of hills, rising to about 2,000 feet, is screened to some extent from the direct action of these winds, and is appreciably warmer than most parts of the island. This is considered an advantage by most of the inhabitants of the island during the winter months, and some, who can afford to do so, live in Port Louis during the winter and inland on the hills in the summer.

At times, and particularly during the months December to March, the south-east trade winds fall and are replaced by light, variable or northerly airs. The high humidity and overhead sun then cause discomfort to Europeans, although the temperatures recorded are not high compared with those endured in Egypt or India.

All temperatures recorded at the Royal Alfred Observatory in the last sixty years fall between 95° F. and 50° F. It is probable that in Port Louis the upper limit is somewhat higher.

Rainfall is sufficient, and, in general, sufficiently well distributed throughout the year to keep vegetation green and abundant, but droughts may occur in which grass and trees become distinctly parched and brown.

Thunderstorms are not very frequent, and damage from lightning is uncommon. Hail and fog are almost unknown. Sunshine is abundant.

The annexed table gives the details of the meteorological readings for 1928 at the Royal Alfred Observatory, Pamplemousses. It may be taken to represent the Port Louis area.

METEOROLOGICAL RETURN FOR THE YEAR 1928.

From the Records of the Royal Alfred Observatory 178 *feet above Sea Level.*

	Temperature degrees F.					Humidity	Rainfall	Winds	
	Absolute minimum on grass	Absolute shade maximum	Absolute shade minimum	Mean temperature	Mean daily range	Mean percentage of saturation	Inches	Resultant direction	Mean recorded speed, m.p.h.
January ..	63·7	91·9	69·6	79·3	13·5	75·8	3.83	E.	5·9
February	66·4	90·7	71·8	79·3	11·0	83·8	14·41	E. by S.	6·8
March ..	56·1	85·6	64·4	77·2	11·2	81·3	6·47	S.E. by E.	7·7
April ..	56·8	83·8	66·0	76 1	10·1	81·4	5·35	E. by S.	8·4
May ..	52·2	83 7	60·3	73·0	10·4	83·9	14·90	E.S.E.	7·1
June ..	44·4	77·7	54·3	68·7	12·6	75·9	1·22	S.E. by E.	7·3
July ..	48 0	79·3	55·2	68·2	11·0	80·8	2·15	S.E. by E.	8·0
August ..	47·5	77·0	58·5	67·6	11·5	76·0	1·12	S.E. by E.	8·8
September	48·2	79·0	58·1	68·9	12·8	73·3	1·42	E. by S.	8·5
October ..	44·4	84·0	56·5	70·7	16·6	66·8	0·60	E.	6·7
November	58·3	87·7	62·8	73·3	13·1	68·8	1·05	E. by S.	9·7
December	62·6	86·9	67·5	76·1	12·4	73·0	2·84	E. by E.	6·7
Year ..	44·4	91·9	54·3	73·2	12·2	76·7	55·36	E. by S.	7·6

Notes on Unclassified Fevers in Mauritius.

During the last two hot seasons I was struck by the number of cases of undefined fevers of short duration, which in the early stages somewhat simulated malaria, paratyphoid fevers, dengue, influenza, typhus fever and heat stroke.

Briefly, these cases exhibited a continuous fever lasting from three to seven days, falling by lysis. A slow pulse was invariably present, and a secondary but slight rise of temperature was frequently noted. Retro-ocular pain and congestion of the conjunctiva were common to all cases. The blood-picture showed a leucopenia with a relative decrease in the polymorphonuclear cells, associated with a late increase in the eosinophile cells. On microscopic examination, blood-slides proved negative for malaria. Blood-culture gave a negative result.

Dengue occurred here in severe epidemic form in 1873, and has been observed in sporadic form from time to time in recent years.

The acknowledged vector of dengue, *Aëdes argenteus*, and to a lesser extent *Culex fatigans*, are common throughout the island, particularly on the littoral.

In these aberrent pyrexias the severe joint pains, primary and secondary rashes, so common in typical dengue, are conspicuously absent. The freedom from catarrhal symptoms and the presence of a slow pulse tend to eliminate influenza. The absence of lice precludes a diagnosis of typhus fever. Heat stroke is practically unknown in the colony.

In view of the fact that some authorities have considered the civil medical statistics of the colony liable to error, particularly with reference to malaria, investigation as to the presence of atypical dengue and sand-fly fever in the colony might not be devoid of interest, as possibly many cases of undefined fevers are erroneously returned as malaria.

When the poorer people in the colony present themselves for medical treatment, they generally state they are suffering from "la fiebre," and are often treated with quinine in outlying districts where microscopic examination of the blood cannot be carried out.

In conclusion I have to thank Mr. R. A. Watson, Director of the Royal Alfred Observatory, for his kindness in giving the meteorological details of the Port Louis area, and to Corporal O. Duggan, R.A.M.C., for his help in locating the haunts of the flies.

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Editorial.

CONFERENCE ON YELLOW FEVER AT DAKAR, APRIL, 1928.

On the initiative of the Governor-General of French West Africa an Intercolonial Conference on Yellow Fever was held at Dakar from April 23 to April 28, 1928. M. Carde, the Governor-General, presided at the Inaugural Session and pointed out that the object of the Conference was to co-ordinate the efforts of the countries in West Africa interested in the campaign against yellow fever. He welcomed the delegates, French, English and American doctors, and referred feelingly to the work of Dr. Stokes and Dr. Guillet, who had fallen victims to their devotion in the last epidemic. Dr. Stokes, a member of the West African Commission of the Rockefeller Foundation, died during his experiments on the transmission of the yellow fever virus at Lagos. Up to the last moment he devoted himself entirely to his work, letting himself be bitten by mosquitoes and giving his own blood so that his case might serve the cause of science.

The programme of the Conference consisted in the reception of general reports on recent manifestations of yellow fever, discussion of laboratory work and of the prophylaxis of yellow fever.

Dr. Lasnet reported on the cases in Senegal. There were 190 cases and 135 deaths. The cases occurred from May to December, with the greatest incidence in September (41) and October (46). Besides confirmed cases there were 30 suspected, with 20 deaths, bringing the total number of cases up to 220, with 155 deaths.

In the first stage of the disease the symptoms were fever with headache, dorso-lumbar neuralgia, redness and swelling of the face, dissociation of pulse and temperature, agitation accompanied by insomnia, vomiting, albumin in the urine, most frequently on the second or third day, and rapidly increasing in amount. Examination of the blood showed neither hæmatozoa nor spirochætes.

In the second stage of the disease, lasting a few hours, there was a fall in temperature, jaundice, vomiting, and melæna. The third stage was characterized by hæmorrhage, especially by black vomiting, melæna and jaundice. Generalized jaundice was only seen when the cases were prolonged. The most favourable sign was a diminution in the amount of albumin in the urine. Post-mortem examination revealed the usual classical signs. The liver and stomach were most affected.

Dr. Lasnet stressed the importance of early diagnosis. It was useless to wait for the appearance of jaundice or black vomiting, as by this time the stegomyia mosquitoes would be already infected.

The best method of procedure which afforded the fullest protection was

to make a distinction in time of danger between the early prophylactic diagnosis of a suspected case of fever, which was only a warning that internal measures of protection should be initiated, and the clinical diagnosis of yellow fever, which left no doubt as to the nature of the disease. When a suspected case occurred in districts where yellow fever was endemic or threatened, the case must be immediately isolated in a screened room, notified by the doctor, and surveillance maintained for six days. Persons in contact with the case must be screened at night and, if the Health Service considerd it necessary, measures of disinfection should be applied without delay.

Yellow fever in Senegal occurred in epidemics with long periods of latency which varied in duration, and did not appear to correspond to any definite cycle nor to be connected with the development of means of communication. The disease disappeared with the cold season. As soon as 64·4° F. was reached the cases became fewer and only spread exceptionally.

Drs. Aitken and Smith reported on an outbreak of yellow fever in Lagos in 1925, with 12 official cases and 7 deaths, and 5 suspicious cases which recovered. The symptoms were much the same as those observed in the Senegal cases. Attempts to cultivate leptospira were made in 13 cases. Varying quantities of blood, usually 5 c.c. but even as much as 10 c.c., were distributed in tubes of Noguchi's medium. All the attempts ended in failure. Blood taken at the same time was inoculated into guinea-pigs, but the animals showed no signs of illness.

Though the organism described by Noguchi was not isolated from any of the cases, the clinical picture and the post-mortem findings left no doubt as to the nature of the cases.

In 1926 eight cases of yellow fever were brought to the British hospital at Lagos. Blood-cultures were made in Noguchi's medium and guinea-pigs were injected with blood. The results were entirely negative.

Drs. Aitken and Smith then discussed the diagnosis in the early stages of the disease. They said when a patient was seen within twenty-four hours of the onset of illness, and a picture of a malarial attack of some severity was associated with the absence of parasites or only a scanty infection, suspicion of yellow fever should be aroused by persistent nausea and vomiting, a rapidly-developing albuminuria and a decline in the pulse-rate with continuance of pyrexia.

Dr. Selwyn-Clarke reported that in Accra there had not been an epidemic of yellow fever for fifteen years, though a few cases occurred every year. In 1926 there were 65 cases with 18 deaths, and, in 1927, 107 cases with 40 deaths. Most of the persons affected were Africans, a race of people who had previously been looked upon as to a large extent immune. The opening up of the country had facilitated dissemination of the disease and also its recognition. In making a diagnosis the chief points relied upon were sudden onset, severe headache, early prostration, rapidly

increasing albuminuria and a relatively slow pulse as compared with the temperature. In spite of the work carried out by the members of the Rockefeller Yellow Fever Commission no organism had been isolated from cases, even when observed within an hour or two of the onset. Noguchi's leptospira had never been found in West Africa.

It was very important to make a correct diagnosis, as the occurrence of two non-imported cases in a town or port within a period of eighteen days called for the declaration of an infected area, and in the case of a port placing the port in quarantine.

When a case was discovered in a port the patient was removed to hospital and placed under a net. Persons living in the same compound were segregated in isolation quarters for six days, during which the premises where the patient fell sick and the neighbouring premises were treated with Clayton sulphur apparatus, or the Liston cyanide plant; extensive anti-mosquito and anti-larval work was also carried out.

When a case occurred in a village out of the beaten track, attempts to isolate the case led to the concealment of cases, or the running away of cases to other villages. Ambulatory cases were common, and men in the acute stage would stroll about and return to work in a few days. These ambulatory cases were a great anxiety, owing to the virus being in a transmissible form during the first three days. While ordinarily yellow fever resulted from the bite of an infected mosquito, other modes of infection were known to exist. Post-mortem material had been shown to be infective.

Outbreaks of yellow fever had occurred in areas where the larval index was low, for example in Accra in 1927, and had *not* been encountered in areas where the index was remarkably high, though such areas were contiguous to similar areas in which many cases and deaths from yellow fever had been met with.

Dr. Selwyn-Clarke attached great importance to the segregation of Europeans in residential areas at least 400 metres from the indigenous population, and African children should not be allowed at any time of the day or night in such areas.

In the French mandated territory of Togoland Dr. Viala reported that there had been no cases of yellow fever from July, 1922, until 1927, when 11 cases occurred with 7 deaths. Eight cases were Europeans and 3 were Syrians. There were no cases in the indigenous population. He thought the infection was imported from the Gold Coast, where yellow fever was prevalent at the same time.

Discussing the reports, the Conference admitted the difficulty of diagnosing the early and ambulatory cases, especially in natives. Albuminuria steadily increasing was considered a most important symptom, though cases might occur, notably the case from which Dr. Stokes was infected, in which the amount of albumin in the urine was small. Albumin occurred in the urine of malaria cases, but it was small in amount and did not increase rapidly as in the yellow fever cases.

Drs. Laigret and Lefou said the diagnosis of yellow fever was complicated by the existence of spirochætal jaundice amongst native Africans. Cases had occurred in the French Congo, and in some of the cases leptospira had been found in the blood, urine and liver. Guinea-pigs injected with blood containing the spirochætes died with marked icterus, and spirochætes were found in the blood and in smears from the various organs.

Bed bugs which had fed on an icterus patient were macerated in salt solution and injected into a guinea-pig. It died with typical symptoms of spirochætosis, and the illness could be reproduced in a series of guinea-pigs with the presence of spirochætes morphologically resembling those in the patient. The disease could not be transmitted from guinea-pig to guinea-pig by the bites of stegomyia bred in the laboratory. With bed bugs it was possible to infect a guinea-pig twenty-four days and thirty-eight days after the infecting meal.

Typical yellow fever cases were seldom confused with infectious jaundice, but when this was accompanied by black vomit, renal and nervous symptoms and bradycardia, it was difficult to distinguish from yellow fever of similar severity.

Dr. Beeuwkes said that the West African Yellow Fever Commission was organized in 1925 by the International Health Division of the Rockefeller Foundation, and had its headquarters and laboratories at Yaba, near Lagos. The investigations of the Commission had shown that there was no clinical difference between the yellow fever occurring in Africa and that in the Western Hemisphere. There was also no fundamental difference in the lesions of the various organs in fatal cases occurring in Africa and in America.

Laboratory experiments which had been carried out for eighteen months were concerned mainly in attempting to isolate the *Leptospira icteroides* from yellow-fever patients by culture and to reproduce the disease in laboratory animals. More than a thousand guinea-pigs, said by Noguchi to be susceptible to *L. icteroides*, were inoculated with material from yellow-fever patients. Blood was taken within forty-eight hours, and in some cases within a few hours of the onset of the disease. None of these animals died with lesions suggesting yellow-fever infection. A number had a slight febrile reaction; these were injected with virulent cultures of leptospira to see if they were immune, but these animals died with typical lesions and the leptospiræ were isolated in pure culture from the blood.

Local African monkeys, goats, rabbits and mice were found to be insusceptible to yellow fever. Large numbers of cultures were made of patients' blood in Noguchi's medium, and though the cultures were kept under observation for thirty days, and others for ten days *in vivo* in collodium sacs in the peritoneal cavity of rabbits, no growths of leptospira were seen.

Pfeiffer's tests, made with eighty-four specimens of patients' serum

with *L. icteroides* and *L. icterohæmorrhagiæ,* gave completely negative results.

These negative results seemed to justify the conviction that *L. icteroides* had no ætiological relationship with West African yellow fever.

As local animals had been found to be refractory to yellow fever, Dr. Beeuwkes obtained a number of Indian monkeys, *Macacus rhesus*, from America. Blood from a severe case of yellow fever from Togoland taken on the third day of illness caused severe fever for three days in a *M. rhesus* monkey, and this animal was found to be immune when inoculated with virulent cultures from other monkeys. Blood from another mild case of yellow fever, clinically almost unrecognizable, taken thirty-three hours after the onset of fever, when injected into another *M. rhesus* caused fever and death on the fifth day. At post-mortem examination fatty degeneration of the heart, liver and kidneys was found. Blood, and liver and kidney emulsion taken at the autopsy were injected into another rhesus monkey. This monkey was taken to Lagos, and on the fourth day after injection it developed fever and forty mosquitoes, *Aëdes argenteus,* were allowed to feed on it. Blood taken on the first day of fever was also injected into another normal rhesus; this monkey died, and the strain has been carried on from monkey to monkey by injecting blood or serum.

Nine other monkeys were exposed to forty *Aëdes* mosquitoes; all these monkeys died with the exception of one accidentally killed. A single mosquito from this lot produced fatal infection in two monkeys eighty-five and ninety-one days after the mosquito had fed on the infected monkey.

Different lots of normal *A. argenteus* have been fed on thirty infected monkeys and only three lots failed to become infective.

As infected mosquitoes were found to live for two months in the laboratory and to remain infected throughout life, they were used to preserve the virus, rather than by injecting infective blood into a series of monkeys.

There was no hereditary transmission of virus from one generation of mosquitoes to another.

The virus present in the blood of a patient, either through the bites of infected mosquitoes or the injection of virulent blood, was filterable through Berkefeld V and N filters, but not through the Berkefeld W grade, even under considerable pressure.

A highly concentrated maceration of infected mosquitoes filtered under pressure through the coarsest Berkefeld filters failed either to infect or to render immune rhesus monkeys, though the unfiltered macerated mosquitoes caused death with the usual symptoms. It was thought that the virus in the mosquito might have different morphology or different dimensions from that present in the blood.

Convalescent serum from a person who had had a severe attack of yellow fever on the Gold Coast protected the rhesus monkey, even in as small a dose as 0·1 cubic centimetre, against experimental infection. Thera-

peutic anti-icteroides serum, even in doses to 5 to 10 cubic centimetres, did not protect the rhesus monkey.

The pathological conditions found in monkeys were similar to those found in man.

On September 15, 1928, Dr. Adrian Stokes fell a victim to yellow fever and died four days later. He insisted that blood should be taken from him for inoculation, and that mosquitoes should be fed on him so that no opportunity might be lost of furthering knowledge of the disease in which he was so interested. The experiments so made confirmed the results which had been obtained with the mild case of yellow fever from the Gold Coast. Three monkeys inoculated with blood on the first, second and third day of his illness died with typical symptoms and pathology of yellow fever, and subinoculations were carried through a further series of nine monkeys. Mosquitoes fed on Dr. Stokes within twelve hours of the onset of his attack proved infective eleven days later, but those fed thirty-six hours after the onset were not infective.

Cultures made with Dr. Stokes's blood and that of the monkeys infected from him showed no growth of any kind and remained sterile after thirty days' observation.

It was impossible to determine how Dr. Stokes became infected. Mosquito transmission seemed out of the question, and the most probable source of infection appeared to be through contact with blood or other material from infected animals. In order to determine whether the virus was capable of passing through the skin the following experiments were made: Several drops of virulent blood were rubbed on the skin of the abdomen of three monkeys, one scarified, the second shaved, and the third entirely intact. All three died with typical post-mortem findings showing that the virus could pass through the unbroken skin. A drop of virulent blood placed in the conjunctival sac, and 0·5 cubic centimetre given by the mouth, proved non-infective for the rhesus monkey.

The rhesus monkeys showed considerable variability in individual susceptibility. But those which had only slight fever and recovered were found to be immune to a large dose of a virulent virus.

Severity of the attack in man cannot be taken as an indication of virulence for monkeys.

Numerous experiments were made by Dr. Noguchi at Accra, and by the staff at Lagos, to determine whether mosquitoes other than the *A. argenteus* were capable of transmitting yellow fever. An authoritative statement could not yet be made, but several species of tree-breeding *Aëdes* appeared capable of transmitting the disease. Noguchi came to Accra in November, 1928, in order to complete his research work, and whilst working in the laboratory there contracted the infection from which he died on May 21, 1928. Noguchi told Inspector-General Lasnet that he had been unable to find any traces of *L. icteroides* there, and that it would no longer be possible to consider this organism as the cause of African yellow fever.

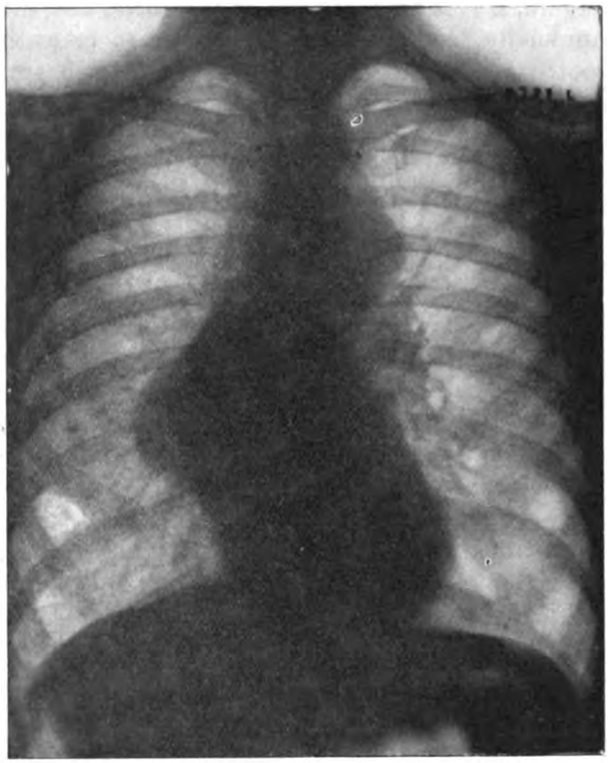
Clinical and other Notes.

AN UNUSUAL TYPE OF ANEURYSM OF THE AORTA.

By Major R. PRIEST,
Royal Army Medical Corps.

L/Cpl. S., aged 41, with twenty-four years' continuous service, was admitted to the Queen Alexandra Military Hospital in February, 1929, and said that he had been on active service with his unit in France throughout the Great War and that, with the exception of a superficial wound of the cheek and "just a touch of gas" in April, 1915, he had been perfectly fit and well until January, 1927, when one evening just after a meal he rose from the table and went over to get his coat from a row of pegs. Having done this, he remembers sitting down in a chair but remembers no more until he found himself in hospital. The notes in the medical history sheet show that on admission he was pulseless and there was marked dyspnœa. This was followed by much vomiting and diarrhœa necessitating subcutaneous salines and strychnine. After a period of thirty-eight days in hospital he went back to duty, and with the exception of some shortness of breath has been well. On February 20 of this year, on rejoining his unit from leave he was medically examined and was admitted to hospital for observation. He says he has had no venereal disease and that he has been temperate. He was a carman prior to enlistment, he married in 1913 and his wife had one miscarriage at three months, and one child died of "influenza" aged 3 months, two remaining children being alive and well. He has had absolutely no pain and was quite unaware that anything was amiss. On examination it was noted that his complexion was ruddy but not cyanosed, systolic carotid pulsation was present in neck, both hands showing some clubbing of fingers. On inspection of the chest a very distinct pulsation could be seen to the right of the sternum over an area commencing from the third costo-sternal junction outwards to within 1¼ inches from the right nipple and then inwards to the sixth costo-sternal union. The cardiac impulse could not be seen or definitely palpated in the normal position when lying down, but could be seen and felt in the fifth space well internal to the nipple when the man leant forward. On percussion an area similar to the above could be clearly delineated, while the left border of the heart was difficult to determine. On palpation the pulsation was definitely expansile in character, the expansion being systolic in time, but neither thrill nor diastolic shock was noted. On auscultation at the apex, the normal sounds were replaced by a soft systolic and a long, soft diastolic bruit. The pulmonary second

sound could be heard in the usual position, but the aortic second sound at the aortic area was replaced by a soft diastolic regurgitant murmur, heard well all the way down the borders of the sternum. Over the pulsating area a soft systolic and a long diastolic bruit were heard. The diastolic murmur could be heard also over the left chest at the back. The heart's action was quite regular at the rate of 80 beats per minute. The radial pulses were equal, small and collapsing in type, and capillary pulsation was seen in the lips. There was no dysphagia, no alteration in the voice, no



cough, and no history of hæmoptysis. No tracheal tugging obtained. Blood-pressure 135/75 in each arm. At the time of admission the right pupil was slightly larger than the left, but after resting in bed the pupils became equal and remained so. Lungs appeared healthy, liver edge palpable, spleen not felt, no free fluid noted in abdominal cavity and no œdema of feet. The toes showed some indefinite clubbing. The central nervous system was unaffected and there was no pyrexia. At this juncture and with this clinical picture before us, it was interesting to consider the differential diagnosis. At first, from inspection and palpation the possibility of transposition of the heart arose, but this was rendered unlikely by the

facts that the liver was normally placed and that the pulsation was expansile and did not present the normal systolic impulse of a transposed, but otherwise normal heart. Also the discovery of the cardiac impulse in the fifth left interspace when the patient leant forward helped to dispel the idea of transposition. As one of the more common pulsating swellings which reach the chest wall is due to an aneurysm of the thoracic aorta, this possibility was considered next. If the physical signs were produced by such a condition, then obviously the aneurysm belonged to that type which is broadly classified as "an aneurysm with physical signs but producing no symptoms." Again, if it is an aneurysm of the aorta, the situation of the pulsation is unusually low, assuming the lesion to be at the level of the actual aortic root. If it is an aneurysm of the aortic arch itself large enough to cause such a large area of pulsation, there is no increased aortic second sound and no diastolic shock, as would be expected, but on the other hand, if the bulging is situated at the sinus of Valsalva, the physical signs would fall into line, viz., systolic expansile pulsation, absence of the aortic second sound and the occurrence of a long, soft diastolic bruit over the swelling, over the aortic area and conducted in the usual manner down the left border of the sternum. In favour of this, too, are the collapsing pulse, the obvious pulsation of the carotids in the neck, and perhaps the capillary pulsation in the lips. Other possibilities were considered in turn, such as a tumour, cyst or abscess exhibiting transmitted pulsation from the heart. If either of these were likely, it would be difficult to explain the signs of aortic regurgitation, unless both conditions were present simultaneously. An enlarged and hypertrophied left auricle might conceivably give pulsation, but not a true systolic expansile pulsation, and there was nothing in the history or in the physical signs to suggest mitral disease. After considering other more rare and remote conditions, the most likely diagnosis reached was aneurysm of the aortic root involving the region of the aortic valves, the aneurysm being intrapericardial in situation and had been formed in a direction downwards and forwards and to the right. The special examinations showed a normal blood-count and a normal urine. The blood W.R., however, was "strong positive." The X-ray of the thorax confirmed the clinical findings and added more to our knowledge, because the film showed the outline of the upper part of left border of heart and the widened aortic arch with some dislocation of the arch to the left. Under the screen the swelling expanded synchronously with the aorta and with ventricular systole. The size of the swelling was half that of a tennis ball. He was seen in consultation by Dr. T. F. Cotton, M.D., Consultant Cardiologist to the Queen Alexandra Military Hospital, who agreed with the above diagnosis of intrapericardial aneurysm of the aortic root. Dr. Cotton very kindly examined the patient with the electrocardiograph and wrote to say that the electrocardiogram was normal and showed no right or left ventricular preponderance.

In conclusion, I should like to express my thanks to Dr. Cotton for

seeing the case and for kindly carrying out the electrocardiographic examination.

The radiographic picture is reproduced to show the unusual features referred to above.

BILATERAL OVARIAN DERMOID CYSTS WITH LEFT OVARIAN MULTILOCULAR CYSTOMA.

By Major J. M. MACFIE, M.C.

Royal Army Medical Corps.

The clinical description of this case is compiled from the notes of Major H. H. Blake, R.A.M.C., and of Major A. S. Fry, I.M.S., who was called in consultation and performed the subsequent operation. It is reported with the consent of the officers commanding the hospitals concerned.

A Eurasian woman, aged 30, married to a British soldier, was admitted at 7 in the morning on February 16 to a British family hospital in India. She had been married for eight years, but had never been pregnant. Menstruation was regular, and she suffered from habitual constipation. As a child she had kala-azar, and six years previous to the date of admission had been in hospital for a fortnight with a "cold in the bladder."

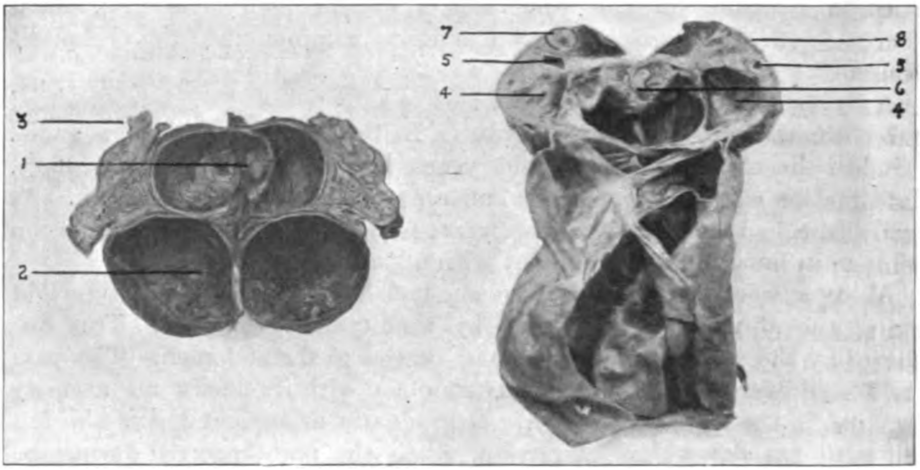
About a week before admission she had an attack of pain on the right side of the abdomen accompanied by rigidity and vomiting. This was relieved by the application of hot-water bottles to the abdomen. The pain was felt all over the right side of the abdomen with its maximum intensity low down in the right iliac region. It gradually disappeared, and she felt well until the day before admission, when the pain recurred during the night and was accompanied by two bouts of vomiting.

She was a woman of fair general development who did not look very ill. The temperature was normal. The pulse was 82 per minute, regular, and of good volume. The abdomen was flaccid, slightly distended, especially on the left side, and moved freely on respiration. Palpation disclosed a large tumour the size of a fœtal head on the left side of the abdomen, dull on percussion, and unconnected with spleen or kidney. There was an area of tenderness low down in the right iliac region. Menstruation commenced on February 18.

On March 1 examination of the abdomen revealed a large central swelling extending rather more to the right than to the left side, and reaching to three fingers' breadth above the umbilicus. The contour of the swelling descended gradually to the epigastrium and steeply to the pubes. Below, the tumour appeared to be anchored within the pelvis by a pedicle passing down in the suprapubic region. It could, however, be pushed up almost to the xiphisternal notch, and was freely mobile from side to side. It felt smooth, tense, and elastic, and there was no tenderness

on palpation. The percussion note over the tumour was dull, and in the flanks tympanitic. Bimanual vaginal examination disclosed a normal cervix and body of the uterus. There was a rounded, tense, rather tender fullness of the right fornix; the left fornix appeared normal.

On March 3 laparotomy was performed under general anæsthesia, by a right, paramedian, subumbilical incision displacing the rectus outwards. The right Fallopian tube was found to be rotated clockwise on its axis through about 270°, and was greatly thickened. The right ovary was enlarged to the size of a tangerine orange, of a purplish colour, and adherent to the anterior abdominal wall and omentum. The right tube and ovary were excised. The large tumour was found to arise from the left ovary, and had contracted numerous omental and posterior parietal peritoneal



adhesions. There was a thin pedicle two inches broad which was ligated, and the tumour removed intact, leaving the tube *in situ*. The uterus appeared normal. The appendix was removed, and the wound closed in layers. The patient left the theatre in excellent condition, convalescence was apyrexial and uneventful, and she was discharged fit and well on March 24.

Examined fresh and unopened, the right ovary was found to measure 3½ inches by 2¼ inches, and to weigh 4 ounces 5 drachms. It felt solid, and the wall was of a dark, mottled purple colour. The thickened tube was attached. The left ovarian mass measured 7½ inches by 4 inches, the greater part being thin-walled, cystic, and translucent. Close to the site of attachment of the tube was a small triangular area of recent hæmorrhage. It weighed 27 ounces 3 drachms.

After hardening, the specimens were cut longitudinally and the following condition discovered :—

The right ovarian mass was largely composed of two rounded, dermoid

cysts, to the smaller of which was applied a triangular wedge of fibrous tissue supporting the thickened cord. The larger of these cysts contained a light yellow, greasy, granular material, intermingled with a tangle of hair, and with some bright red blood in the centre. The smaller cyst contained a similar material, of a light anchovy-paste colour with a small quantity of hair intermixed.

When the contents were removed, there was discovered embedded in the wall of the smaller cyst, at the point marked 1 in the photograph, a hard projection closely resembling a small bicuspid tooth. At the point marked 2 in the larger cyst was a similar double projection, but of fibrous consistency, from the circumference of which sprang a tuft of coarse, black hair. At point 3 is the fimbriated end of the thickened Fallopian tube.

Section of the left ovarian mass liberated from the large thin-walled cystic portion a clear, yellow, serous fluid, and showed the multilocular arrangement. The more solid portion contained three cavities marked 4, 5 and 6 in the photograph. Of these, numbers 4 and 5 were filled with a light, reddish grey, greasy material, and number 6 with a yellow, sebaceous material intermixed with hair. Evacuation of the contents of 4 and 5 displayed smooth walls, but when the contents of 6 were removed there was found to be a rather irregular semicircle of bone, with rounded projections, rather suggestive of a primitive vertebra, embedded in the wall. This bony semicircle had to be forcibly broken to allow of the specimen being completely opened out. At point 7 was embedded a round semi-translucent nodule of cartilage. Point 8 indicates the site of attachment of the Fallopian tube.

The condition was one of multiple dermoid cysts of both ovaries, with a multilocular ovarian cystoma on the left side.

Echoes of the Past.

A SURGEON OF THE ROYAL ARTILLERY.

By Major OSKAR TEICHMAN, D.S.O., M.C., T.D.
Royal Army Medical Corps, T.A. Reserve.

Towards the end of the year 1798, the British Government became aware that Napoleon was about to invade Palestine, with the intention of crushing the Turkish army in that country, before the chief Ottoman force (which was assembling at Rhodes) should have time to reach Egypt by sea.

Although Nelson had destroyed the French fleet at Aboukir Bay in August of the same year, Napoleon had by this time gained a strong footing in Egypt. His Majesty's Ministers decided therefore to send to the Dominions of the Grand Seignior a British Military Mission, which was to

proceed to the seat of war in Palestine as quickly as possible, and to co-operate with the Turks against the common enemy, the French. For this purpose Brigadier-General Koehler,[1] who had been in Turkey before, was selected, together with several officers of the Royal Engineers and Royal Artillery. These and a number of N.C.O.'s and artificers composed the Mission, amounting in all to seventy-six officers and other ranks.

The officers appointed to serve under General Koehler were: R.E., Colonel Holloway, Major Fletcher and Captain Lacy; R.A., Majors Hope, Fead, and Leake. Secretary to the General, Captain Franklin, H.E.I.C. Commissaries, Messrs. Chandler and Whiteman. Draughtsmen, Messrs. Read and Pink: and, last but not least, William Wittman, M.D., M.R.C.S., Surgeon of the Royal Artillery.

Wittman, who at the time of his appointment to the Mission was stationed at Woolwich, was an observant man, keen on his profession, and a meticulous diarist. From April, 1799, to March, 1802, he kept both a general and medical journal, which are of considerable interest to those who served with the E.E.F. in the Great War. Some readers will be on familiar ground when they follow him from Constantinople to Gallipoli, thence to Jaffa, Jerusalem, Gaza, El Arish, Kantara, etc.

Wittman's diaries are verbose and very lengthy; he describes in detail nearly all his clinical cases and gives us treatises on plague and ophthalmia; he even records the state of the barometer, thermometer and wind three times a day over a period of three years! When he has a slight headache he records the fact; he solemnly notes down his T.P.R. whenever he has a Turkish bath, and does not spare the reader the minutiæ associated with any important meal!

However, various interesting facts may be culled from this mass of information, and to these the present writer has added a few historical facts, of which Wittman was ignorant when he wrote up his daily journal. Owing to the latter's orthography as regards place-names being entirely phonetic, the spelling used in the official maps of to-day has been followed.

During December, 1798, General Koehler, accompanied by five of his staff, set out from England, proceeding overland to Constantinople, a hazardous and uncomfortable journey performed on horseback in mid-winter, which would nowadays be accomplished by a Military Mission in the luxurious Orient express, or by aeroplane. However, after various vicissitudes and great hardships, Koehler and his companions arrived in Constantinople in the middle of March.

On April 1, 1799, the New Adventure transport, carrying the remainder of the officers (including our Surgeon of Artillery), N.C.O.'s, women and

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[1] An officer of German birth, who joined the R.A. (No. 605 in the list of officers of the Royal Regiment, published 1900) in 1779 as Second Lieutenant; served in the defence of Gibraltar, 1780-83. A.D.C. to Lord Heathfield; invented a gun carriage. In 1790 seconded for service with the Belgian Army, as Major-General, against the Austrians. Brevet-Colonel, 1794.—*D.N.B. and Jl. for Army Hist. Research*, January, 1929.

children, together with the artillery and ordnance stores, sailed from England under convoy of "H.M.S. Charon," forty-five guns, and, after an uneventful voyage, reached Constantinople early in June. It seems strange nowadays that a Military Mission in war time should be accompanied by women and children, but even ten years later, in the Peninsular Campaign, it was not unusual for the British soldier to be accompanied on active service by his wife. Several of these women, including the General's wife, died of plague in Palestine during the campaign.

Meanwhile Napoleon, after traversing the Sinai Desert, had captured El Arish, Gaza, and Jaffa, but had been forced to raise the siege of Acre owing to the heroic defence of that town by Sir Sidney Smith and a handful of British sailors, aided by a few thousand undisciplined Turkish soldiers. The French actually commenced their retreat to Egypt on May 20, ten days before the complete British Mission had assembled in Constantinople.

Although the Grand Vizier and his army left Constantinople for the front during June, the British Military Mission appeared to be in no hurry to proceed to the seat of war, and actually remained on the shores of the Bosphorus for nearly a year enjoying the liberal hospitality of the Turkish Government. One of the R.E. officers was detailed to accompany the Grand Vizier, but was prevented from doing so by "reporting sick" to Wittman on the day of departure. Another officer, Major Fead, sailed to Acre on a Turkish man-of-war a few weeks later (not knowing that the siege had already been raised), where he subsequently died of plague.

During the year spent in Constantinople, Wittman appears to have been the busiest member of the Mission. For the first few weeks he was kept busy "extracting balls" from the wounded Turks who had been brought by ship from Acre. He made friends with the Surgeon of the Grand Seignior, and carried on a lucrative practice amongst the Turkish notables. Wittman's services were much in request, which we can well understand when he states: "There are in Constantinople 5,000 persons who *profess* the different branches of the medical art, but they are utterly ignorant of the principles of either medicine or surgery."

Referring to the general health of the Turks he remarks: "They are certainly not subject to the multitude of diseases which infest other nations. Sores and wounds heal with more facility. Much may be ascribed to their temperance. Fontanelles or issues are in common use, and somewhat lessen the evils resulting from the indolent and inactive life which the Turks generally lead. Cutaneous affections, herpetics and tettery eruptions are common, particularly on the head. Their greasy food, inactive life, their excesses in the use of smoking tobacco and opium, may give rise to these disorders. Besides plague, they are occasionally subject to fevers. . . ."

Wittman treated many cases of "fever," both amongst members of the Mission and also Turkish civilians. He diagnoses malignant, bilious,

remittent, intermittent, putrid, and low fevers. The Army Medical Officer in 1799 had never heard of those subtle diseases P.U.O. and N.Y.D.! That Wittman was thoroughly up to date is shown by the following entry: "December 12, 1799: I inoculated Master Sidney Smith who had been under my preparation for some days."

This no doubt refers to vaccination against small-pox, introduced by Jenner in 1798.

From his diary Wittman appears to have been a physicist as well as a surgeon. On September 16, 1799, he writes: "I rode to Belgrade (a village near Constantinople) and returned to Buyukdere; I brought home with me some of the air to examine."

He does not tell us how he carried out his analysis, or the results he obtained!

Sometimes the British gunners instructed the Turks in the art of firing red-hot shot, and on these occasions Wittman was always present in case of accidents. He attended many court functions, and wrote up his diary regularly, describing the places he visited and the scenes in which he took part.

Together with the other officers of the Mission he was present at numerous dances, dinners, and receptions given by various ambassadors and ministers, and made the acquaintance of Lord Elgin, the British Minister, who a few years later was to transfer a portion of the famous Parthenon frieze in Athens to the British Museum.

When not engaged in social functions in the capital, the British Mission found time to make expeditions to places of interest on the Golden Horn, the Bosphorus, the Sea of Marmora, and the Dardanelles. On one of these excursions the forts at Sed-El-Bahr and Chanak were visited; at the latter place Wittman was much intrigued at seeing a Turkish sentry eating his lunch inside the muzzle of a gun, in order to keep out of the rain. It is interesting to learn that the old fort at Chanak, which Admiral Sir John de Robeck destroyed in March, 1915, was designed by Lieutenant Colonel Holloway, R.E., of the British Mission in 1799.

While at Chanak the Turkish gunners were anxious to show the British officers that their marble cannon balls, fired *à ricochet*,[1] could reach across the Dardanelles. Our surgeon of the Royal Artillery witnessed this performance, and records the fact that a family of three sitting in a field on the European side of the Dardanelles was killed by one of these balls, "thus furnishing a satisfactory but melancholy proof of the efficacy of the Turkish Artillery!"

Towards the end of the year 1799, the British Mission, which had been

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[1] Invented by Vauban for clearing a "covered way"; the piece was only half charged, so that the ball rolled and rebounded. In this instance it skimmed the water, playing "ducks and drakes."

so hurriedly dispatched to the seat of war some ten months previously, was sent to Kum-Kale[1] by the British Minister in Constantinople.

Wittman tells us that :—

"The purport of our journey thither was to procure a very curious bas-relief and the celebrated Sigaean inscriptions for Lord Elgin, who had seen them and was desirous to transmit them to England."

A curious but perhaps not unpraiseworthy way of utilizing a Military Mission.

Wittman continues: "The Greeks, by whom the village was exclusively inhabited, were extremely averse to these bas-reliefs and inscriptions being taken away. Their reluctance, we were told, arose from a superstitious opinion they entertained that by touching these stones agues were cured."

But what could a few Greek villagers do against the Officers, N.C.O.'s, and artificers of the Royal Artillery?

In spite of their owners' "reluctance" the stones were duly removed and handed over to Lord Elgin, who had them conveyed to England! According to Wittman this appears to have been one of the most important tasks accomplished by the Mission, during its pleasant sojourn of twelve months in Constantinople. Meanwhile the R.A. draughtsmen were employed in making drawings of the most picturesque views in the Turkish capital.

However, this pleasant state of affairs, as far as the Mission was concerned, could not go on indefinitely; perhaps General Koehler suddenly realized that he had been dispatched by the War Office to the seat of war; Constantinople could hardly be regarded as such. Perhaps he received a sharp reminder from home. In any case Wittman writes under January 19, 1800: "To-day General Koehler, Major Fletcher, Captain Leake, and Mr. Pink (draughtsman), left for Syria by land, disguised as Tartars."

And on June 15, more than a year after its arrival in Turkey, the rest of the British Mission (including women and children attached) left Constantinople and embarked for the seat of war.

In the interim the French had evacuated Palestine; Napoleon[2] had returned to France; Kleber, after signally defeating the Turks (early in 1800) at Damietta and Heliopolis, had been assassinated on the steps of Shepherd's Hotel; and the French army under Menou had concentrated about Alexandria and Cairo.

The Turkish transport which carried the British Mission took over a fortnight to accomplish the journey from Constantinople to Jaffa: this was partly due to the fact that Scio, Samos, Patmos, and Cyprus were visited *en route*. Our Surgeon informs us that he experienced a very unpleasant

[1] Where the French landed in April, 1915.

[2] Wittman tells us that the Sultan, when he heard of Napoleon's escape, immediately had a Turkish Admiral decapitated :—

This was no doubt, "to encourage the others," as Voltaire remarked at the time of Byng's execution.

motion from the rolling of the boat. On July 1, Gaza was sighted; the transport therefore turned northward and cruised along the coast until Jaffa was identified. This town had been for some months the advanced base of the Grand Vizier's Army. Wittman precedes his description of Jaffa with the following platitude :—

"We were now debarked on the Syrian coast, to be the spectators of great military events, in which we were ourselves to be engaged; and that in a country on which history, both sacred and profane, has conferred the highest celebrity."

Soon after landing, he noted a painful sensation of the eyes owing to the heat, and informs us that this did not surprise him, "as during the summer solstice the natives are subject to violent ophthalmies."

The officers of the British Mission, especially the M.O., were very shocked at the condition of the Turkish camp. The tents, pitched in an irregular manner, were situated amongst partly interred bodies, and carcasses of horses and asses, and camels.

During the eight months which the Mission spent in Jaffa epidemic diseases, especially plague, were rampant. General and Mrs. Koehler died of this disease, also several gunners, artificers, women and children. Wittman had many sick to look after, and discovered that "external friction with warm oil" was the best prophylactic against plague. He records the fact that Dr. White, a naval surgeon, inoculated himself (contrary to Wittman's advice) against plague, by injecting the matter from the bubo of a pestiferous patient, and died on the fourth day. Wittman describes nearly all his cases, and his notes generally conclude with the words, "the patient expired." After the Grand Vizier's body-physician had died of plague, and also thirty-six of the suite, our surgeon had the unenviable task of attending to the Turkish staff, amongst whom plague was rampant. But Wittman records some cures, especially in cases of "ophthalmy." Some of these yielded to ung. hyd. nit. with tr. opii, others to blisters behind the ears. He cured a case of secondary lues venerea, by means of nitrous acid dil. and oxygenated muriate of potash, in two months. "Not one grain of mercury was used in any shape."

Towards the end of July, 1800, some consternation was caused in the Turkish camp when it became known that the French were advancing again and had reached Katia in considerable force. A few days later it was announced that the enemy had reached El Arish. This news caused a panic in the Turkish army, and at the urgent request of the Grand Vizier, Lieutenant-Colonel Holloway, now in command of the British Mission, organized the defences of Jaffa. When this scare had subsided, Wittman and some of his fellow officers made an expedition, via Ramleh Latron, and Enab, to Jerusalem, about which he gives a lengthy description. The priests informed him that Napoleon had intended to bury the first grenadier, who fell in the assault, in the Holy Sepulchre! Our surgeon was greatly intrigued at the fly-eating propensities of the numerous chameleons which

he observed in the camp; he dissected one of these and "was much pleased with the singular conformation of the little animal."

He gives us a list of the principal officers in the army of the Grand Vizier: this, in addition to the usual executive officers on the staff of an army, includes O.C. pressgangs, principal dog-keeper, and bird-keeper in chief; possibly the latter appointment corresponded to our O.C. pigeons in the Great War.

While at Jaffa, Wittman visited the sand-hills, three miles outside the city, where he saw evidence of the "horrid massacre" which had taken place three months previously; the skeletons and clothing of the unfortunate victims lying scattered in all directions.

This refers to the execution of Turkish prisoners by the French in 1799. During the siege of Jaffa a part of the garrison, amounting to about 2,000 men, held out in the mosques and citadel for some time longer than the rest, but at length seeing no chance of rescue surrendered.

The French soldiers murmured, asking how these infidels were to be fed, when they themselves were already short of rations. Napoleon discussed the matter with his generals and decided that, in this case, necessity left no room for mercy. Three days later the prisoners were marched out and shot or bayoneted to a man just outside Jaffa. Napoleon tried to justify this sinister deed on the treble plea that he could not afford the soldiers to guard so many prisoners, that he could not feed them, and that he could not grant them the benefit of their parole, because they were the same men who had been set free on such terms when El Arish was captured.

Early in February, 1801, the Grand Vizier decided to advance in force against the enemy, but before we follow the Ottoman army and the British Military Mission (with its artillery surgeon) through Southern Palestine and the Sinai desert, it will be necessary to examine the march of events at home, and the subsequent formation of a British E.E.F., during the eight months spent by Wittman in the pestilential camp of Jaffa.

From the time when Napoleon landed in Egypt, the occupation of that country by a French army, and its possible consequence to our Empire in the East, had caused the gravest anxiety to the British Government. Although Nelson had destroyed the French fleet in August, 1798, and Sir Sidney Smith had checked Napoleon at Acre, no British troops had been sent to the Near East, excepting the Military Mission.

At length in the autumn of 1800 it was decided, in opposition to the wishes of King George III and the younger Pitt, to dispatch an expeditionary force to Egypt.

By February, 1801, the Fleet under Lord Keith, carrying Sir Ralph Abercrombie and his army, were already in possession of Malta; another army, composed of British and Indian troops, had landed at Suez; and, lastly, the army of the Grand Vizier was prepared to co-operate with General Abercrombie, whenever he should effect a landing in the neigh-

bourhood of Alexandria. The command of the French army had devolved at this date on Menou, who had distributed his relatively small force in the Delta.

On February 25, 1801, the Ottoman army left Jaffa and commenced its leisurely march towards Egypt. Wittman tells us that the Turks abandoned all their sick, after instructing them to make the best of their way (on foot) to Constantinople, some thousand odd miles distant!

A day's march brought the army to Yebna, where it halted for about two weeks. The plague, which had been dormant for some time, now broke out again, and Wittman records the death of one of the women attached to the Mission, called by the not inappropriate name of Mrs. Comfort. At Yebna part of the army mutinied, the Albanian troops, who had received no pay or rations, deserted, and the British Mission went in fear of their lives. Colonel Holloway at length persuaded the Grand Vizier to advance once more, and on March 12 the Turks crossed the Wadi Sukereir by the old stone bridge and reached Esdud. Wittman tells us that the army maintained a pace of three miles an hour, halting only twice in the course of the day.

At Askalan, the ruins of which the surgeon describes, a night was spent, whence Gaza was reached on the following day. Here the army rested for ten days, while Wittman thoroughly explored the neighbourhood, and in the suburbs of the town shot an antelope which was much appreciated by his mess.

On leaving Gaza the Turks experienced considerable difficulty in crossing the Wadi Ghuzze, which was in spate. At Khan Yunus the British Mission heard with great joy of Abercrombie's successful landing at Aboukir Bay and subsequent victory at Alexandria.

Between Khan Yunus and Sheikh Zowaid, Wittman comments on the boundary stones "which separate Asia from Africa," and on the sudden change to desert scenery. The trek from Sheikh Zowaid to El Arish (some sixteen miles) was accomplished in one day. In the vicinity of the latter town, which had not in those days yet fallen into decay, and which boasted strong fortifications erected by the French, the Turks encamped for nearly three weeks. During this time the Mission suffered great hardships; the British officers experienced their first khamsin, which Wittman describes; he also complains: "Of the deprivation of provisions, the plague, and the frequent intestine quarrels among the Turkish soldiery—surrounded in our forlorn situation in the desert by a train of threatening evils, among which may be enumerated pestilence and famine, and battle and murder, and sudden death."

At length to Wittman's great relief a transport arrived off El Arish with grain, and a few days later the army continued its march. At Bir Masaid sufficient water was collected to enable the troops to cross the waterless part of the Sinai Desert, three days' march to Katia, where a fresh supply would be obtainable. On the march the Ottoman army

maintained an establishment of "sackars," a corps selected from the Janissaries, to attend and supply the troops with water; these sackars were mounted on horses provided with bells, and each horse carried two leathern sacks containing forty gallons of water. Wittman remarks on the good discipline which prevailed in this water duty corps.

Considering the extremely heavy going in deep sand (which members of the E.E.F. in 1916 will remember) between Masaid and Bir-el-Abd, it is surprising to read that the Turks marched the weary forty-five miles in two days, halting only at Mazar. Wittman was much impressed with the dried-up salt lakes which he passed, especially the Sabkhet-el-Mustabig; here he dug a hole, found brackish water, subjected the latter to a careful chemical analysis and found that it contained—a large proportion of salt! As he rode along the ancient pilgrim track, which connects Egypt with Palestine, our surgeon collected specimens of "a saline substance, finely crystalized, very shining and brilliant, for future experiments." He was "much gratified by the view of the surprising visual deception, which the French term *Mirage*," and which has been described with great ingenuity by Monge[1], of the French National Institute.

The route was strewn with the carcases of horses, camels, and asses left by the French during their retreat. Wittman comments on the thirty miles of heavy sand which he crossed between Mazar and Bir-el-Abd; as he approached the latter place he could distinguish the notes of the nightingale.

At Katia Wittman found good water in the wells, but in one of them it was black and offensive, "like that which is procured at Harrowgate." Between Katia and Dueidar, the next camping place, an advance party was sent forward to prepare a causeway over a river, as the stone bridge had been destroyed by the French. This river,[2] according to Wittman, was a branch of the Nile which flowed into the sea near Pelusium.

On approaching Kantara other branches of the Nile were negotiated, and numbers of pigeons and ducks were encountered. Wittman shot several of these, which were highly acceptable to his mess, now reduced to the spare diet of bread, coffee, and a little rice.

At Salhia the Grand Vizier made his public entry into Egypt, which must have been an inspiring sight! First a line of cavalry, small parties of horsemen riding up and down in front of the line, and firing at full speed. Next another line of Arnauts, with the led horses of his Highness, and the *imaums* singing hymns. Next followed Colonel Holloway and the British Mission, the Turkish officers of State in succession, and his Highness the Vizier, with his bands of music and attendants. And lastly a body of cavalry closed the rear.

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[1] Gaspard Monge (1746-1818), mathematician and physicist, who accompanied Napoleon to Egypt and was made Professor of the Ecole Polytechnique and Count of Pelusium.

[2] It disappeared when the Suez Canal was constructed.

At this awe-inspiring sight five hundred Frenchmen who constituted the garrison at Salhia fled precipitately.

The British Mission now left the Grand Vizier, and joined Abercrombie's army; and with it took part in the minor actions which culminated in peace with the French.

"The labours of the British Military Mission acting with the Turkish army drew at length to a conclusion after a series of painful, harassing, and critical events, many of which cannot, for obvious reasons, meet the public eye."

Wittman received a gold medal from the Grand Vizier, in testimony of the approbation of the Sultan for the services he had rendered. He also received a letter, eulogizing his services to the Turkish army, to be delivered to the British Ambassador in Constantinople, Lord Elgin.

Considering the dangers to which the personnel of the British Mission were exposed, we may congratulate Wittman on the relatively small number of deaths which occurred. Out of a total of seventy-six officers and other ranks, twenty-four died of plague, fever, dysentery, and convulsive affections. Of the 18 women and 16 children who left England, 4 of the former and 6 of the latter died.

On March 24, 1802, the Mission sailed from Alexandria for Constantinople. The Peace of Amiens having been concluded on March 27, 1802, it was decided that the journey should be continued from the Turkish capital overland. Wittman has left us a most detailed description of this journey through the Balkans, Hungary, Austria, Germany, and Holland. He landed at Harwich on July 23, 1802, and soon afterwards returned to Woolwich for duty, where he completed his personal, medical, and meteorological journals.

THE WHITE MAN'S GRAVE IN THE EIGHTEENTH CENTURY.

By Lieutenant-Colonel R. STORRS.

Royal Army Medical Corps.

Having been given, by the courtesy of the Colonial Secretary, the "run" of the Secretariat library in Sierra Leone, I recently came across an old book, "Travels in Africa in the years 1785 to 1787," written by a French gentleman, Monsieur Colbery.

In the hope that his observations on the climate and the prevailing diseases may be of interest to readers of the Journal, particularly to those who have served in Sierra Leone, I have made extracts of his more important remarks. His high opinion of the integrity of the English Medical Service is gratifying.

The temperatures which he notes as having been taken in the Sierra

Leone river were presumably taken on board ship, as they are very much higher than modern observations—the temperature at the Tower Hill station rarely exceeding 90° F.

Of the principal diseases which he enumerates, it would be interesting to have the views of experts on what he means by the "Dry Belly-ache." As it does not appear to have been so fatal as malignant nervous fever (apparently malaria), it can hardly have been yellow fever. Another interesting point is the apparent great prevalence of tetanus; possibly some of these cases were cerebral malaria or heat stroke.

There appears to be an idea among laymen that the labours of the Medical Services have induced not only improved health, but also improved climate. From the description of the "putrefactive properties of the first pluvial waters" one could almost believe that our lay friends are right, and that we can conquer Nature! But what a climate, and how well we who served out there deserved our extra emoluments!

COLBERY'S TRAVELS IN AFRICA, 1785, 1786, 1787.

Temperatures at Sierra Leone (in the river of Sierra Leone):—

During the months,		November to March—	6 a.m.	.. 77·25° F.	mean temperature	
,,	,,	,, ,, ,,	Noon	.. 99°	,,	,,
,,	,,	April to June	6 a.m.	.. 89°	,,	,,
,,	,,	,, ,, ,,	Noon	.. 102°	,,	,,
,,	,,	July to October	6 a.m.	.. 94°	,,	,,
,,	,,	,, ,, ,,	Noon	.. 108°	,,	,,

"There is no doubt that the first rains are very pernicious. They moisten and corrupt in twenty-four hours everything they touch . . . . woollen stuffs they cover with spots that soon breed worms . . . . raw and tanned hides experience the same effect.

. . . . As soon as the rains commence, the earth, which was before dry, and parched, is in an instant covered with reptiles, crabs, and worms: the meadows and forests are filled with flies and other insects; and in short, many other symptoms too numerous to relate sufficiently prove the putrefactive properties which the first pluvial waters contain. . . . . The excessive heat of the sun, which at this season is almost vertical, dilates and dissipates instantly the accumulated clouds, when the solar rays become stifling and almost insupportable: all the pores and perspirative canals become open and enlarged, and the sudorific exhalations fly off in abundance. But new clouds soon accumulate, become condensed, and intercept the solar rays; the air refrigerates, the pores close, the perspiration ceases; and these frequent variations, which succeed each other rapidly, must necessarily produce the most fatal effects, and may be reckoned among the causes which occasion the diseases of the rainy season. And lastly, the vapours which arise from those extensive and impervious forests; those which exhale from low and marshy grounds, and from the numerous animal and vegetable remains with which the soil is covered, must produce in great abundance the Putrid Miasma.

"I shall here speak only of the principal five complaints which attack Europeans, in the countries dependant on the Senegal government.

"The *Malignant Nervous fever* is the most dangerous. It prevails during the whole rainy season; but the East wind, which begins to blow during the month of December, generally causes it to disappear.

"The Malignant nervous fever, thus called by the English, is a dreadful disease when it takes place in all its virulence. The symptoms are violent; they seize upon the invalid all at once, without making any graduation. From the first moment of its attack it is excessive, and the blood is heated to a degree beyond all analogy with what is ever observed in Europe.

"The ordinary duration of this disease is seventeen days, and the ninth day is the most dangerous, as it is generally at this period that the morbific matter exercises all its power. Many perish at this stage of the disease, but some die later; though it has been generally observed that when they happily pass over this day they generally reach the Crisis, that effort of Nature herself which the doctor should foresee and observe, as it almost always saves the life of the patient when he has strength to resist the attack.

"This disease, so common and so fatal to Europeans newly arrived, is in fact a mortal epidemic during the rainy season. On the breaking out of these fevers, Antimonial Tartar and Quincina are the usual remedies; but those who are lucky enough to escape this cruel disease ought to be extremely careful during convalescence, for a relapse is hardly ever surmounted.

"These malignant fevers are often attended with the Dysentery; sometimes also, the flux appears without fever, and at other times it produces the fever. The primitive, or dysenteric flux, is very common in Africa, and though infinitely less dangerous than the malignant nervous fevers, it nevertheless requires a careful regimen and good treatment.

. . . . "The usual methods employed in curing this disease are venesection when the pain is great, and fever very strong: but this remedy must be administered with caution; likewise ipecacuanha, emetics, bitter and wormwood salts, pure opium, camphor, mint waters, and lemon juice.

"The principal symptoms of the *Dry Belly-Ache* are a general heaviness, a fixed pain in the pit of the stomach, a sensible decrease in appetite, a yellowish tinge in the face, nausea, an abundant expectoration of an acrous viscid matter, and a very obstinate constipation. The opinion of the English doctors with regard to the most efficacious remedies for this complaint is the use of opium, which they administer with great perseverance, either by way of fomentations, or wet applications to the part affected, till spasm and pain decrease; then only they use aperients, but principally clysters administered repeatedly during the same day. They consider as preservatives, the wearing next the skin a fine waistcoat of English flannel; and drinking, every morning, fasting, a weak infusion of ginger. I frequently used this infusion, or else weak lemonade made with the juice of

small lemons, produced by a species of wild lemon tree, and rendered this beverage very agreeable by mixing with it a little sugar. Perhaps to this circumstance I may ascribe my not having had the Dry Belly-ache during the whole of my residence in Africa.

"*The Tetanos* is a disease peculiar to hot countries. It is a kind of universal spasm or convulsion, or a general and uniform contraction, the principal symptoms of which are excruciating pains, the face red, the eyes fixed, the respiration obstructed, and it is hardly possible to open the mouth; the bowels are constipated and extremely costive. Happily this disease seldom attacks adults, who never experience it except after a sudden and great refrigeration of the air, a heavy blow on the head or loins; or in consequence of some deep wound received by a gun or pistol, or an edged instrument. Opium appears to be the best and surest remedy.

"*Guinea-worm* . . . . In many parts of Africa it is considered to be contagious . . . . I think the immediate cause of this complaint may be referred to the briny, unwholesome, and stagnant water of this part of Nigritia and Guinea. . . . . It cannot be too much recommended to Europeans who frequent or inhabit Western Africa, never to use, either for drinking or washing, or for preparing food, water until it has been thoroughly filtered and purified. Government would, doubtless, willingly furnish the soldiers with means to avoid drinking unwholesome or impure water; and if these precautions should entail an additional expense, the public treasury would be amply indemnified, first from decrease of expense in the hospitals, and secondly from the incalculable advantages of preserving the hardy soldiers inured to the climate, and of diminishing the dreadful ravages of disease, which necessarily demands new supplies—the expenses of which are very considerable.

"At the period when I visited our establishments in Africa, and our Colonies in America, it was much to be descried that our doctors and surgeons were in possession of more extensive knowledge with regard to the diseases prevalent in the Tropics; and in this were greatly inferior to the English, who are versed in this interesting part of human science. Their doctors have studied much more than ours the nature of tropical diseases; they know better how to conduct and cure them. It is true, when they quitted England they were well instructed, because the Society of Physicians at London possess an immense quantity of observations on the diseases peculiar to every climate in the world: and this naturally results from the indefatigable industry of the English nation, and from the enormous extent and excessive activity of its commerce.

"I was acquainted in Africa with many medical gentlemen of this nation, and I willingly pay homage to the zeal which animated them, and to the attention with which they studied the causes, the nature, and the difficulty of the horrid diseases which devour so many Europeans in these burning countries. They exercised their profession with that laudable self-denial, with that assiduity and attention, which arises from a real love of glory and

humanity; and I admired in them those virtues which I regret to say are not so common among ourselves.

"Perhaps it may be asked how is it that, with so many advantages in regard to a science so valuable and useful, and when glory and humanity are the only motives of emulation among those who practise that science, so many English die between the Tropics? . . . . This must be ascribed to the incredible intemperance of the English soldiers and sailors, who abandon themselves to it without restraint to excessive debauchery; and above all, to the strong liquors which they drink, and the pernicious abuse of which occasions in hot countries so many deaths. In general, the French soldiers and sailors indulge much less in these excesses. . . . . I had, in conformity with the English custom, acquired the habit of washing myself with a sponge, in warm water, every day. . . ."

That these observations on the fatal effects of the climate of West Africa, in the eighteenth and earlier years of the nineteenth centuries, on inexperienced or intemperate Europeans are not exaggerated, a perusal of the records of the Colony of Sierra Leone will prove. The average tenure of office of the officials, from the Governor downwards, was, until well into the nineteenth century, less than twelve months: death, or invaliding, quickly claimed them.

In the cathedral at Freetown are memorials to governors and other high officials, and to officers of the garrison. Almost all of these died before the age of 40; and save a few who died of wounds, all succumbed to the fatal climate. One inscription records an officer who "survived the Battle of Waterloo, but who fell a victim to this climate." The garrison, consisting of men of the Royal African Corps, was largely a penal battalion, its rank and file being recruited from the worst characters in the British Army, and it is stated that none of them are known to have survived to return to England.

Could the shade of Monsieur Colbery now revisit Sierra Leone he would find a very different state of affairs, thanks chiefly to the unceasing efforts of those English doctors for whom he expressed so much admiration. "The Tetanos," dysentery, guinea-worm, practically non-existent; and malaria, though still uncomfortably prevalent, become a disease rarely fatal. And the British soldier no longer a victim of vice and intemperance!

Current Literature.

SALAS VAZQUEZ, M. Las defensas antitíficas dependientes del proceso fisiologico de la digestion. **[Immunity to Typhoid depending on Normal Digestion.]** *Rev. Méd. Barcelona.* 1928, v. 10, 304-28. [51 refs.]

The author put up several series of tests with graded dilutions of gastric juice, HCl, HCl with pepsin, HNO_3, H_2SO_4, lactic, citric and tartaric acids, and estimated the effects on cultures of *Bact. typhosum* after varying periods of contact at 37° C.

He finds that bacilli which are in contact with gastric juice for an hour are still viable, but after that period are killed. After contact for 6 hours the organisms still retain their antigenic properties, but after 12 hours they become disintegrated and have lost all immunizing properties as tested by agglutination subsequently. Infection, consequently, is favoured by the quantity of bacilli and the vehicle in which they are ingested; if in fluid, they pass on too rapidly to be acted upon sufficiently by the gastric secretion; hence salads, fruit and shell-fish which remain longer for purposes of digestion form a better medium (provided the bacilli are not in too great numbers) for bringing about immunity.

To destroy cultures of *Bact. typhosum* experimentally the HCl must be in a strength not less than 1 : 200; since in gastric juice the proportion is 1 : 500 the acid alone could not sterilize, but in the presence of pepsin was found to do so in an hour, and the dead bacilli act as antigens, the stomach preparing automatically a vaccine, to which the author ascribes the relative immunity of an indigenous population in an endemic centre of the disease.

H. HAROLD SCOTT.

Reprinted from "Bulletin of Hygiene," Vol. 4, *No.* 6.

v. BOKAY, J. Gürtelrose und Windpocken. [**Herpes Zoster and Varicella**]. *Jahrb. f. Kinderheilk.* 1928, v. 119, 127-60, 20 figs. [64 refs.]

The author, who is professor of children's diseases at Budapest, was the first to maintain that there was an ætiological connexion between herpes zoster and varicella, the date of his first publication on the subject being 1892.

The subject has since received the attention of numerous writers, especially LE FEUVRE, of Buluwayo (1913 and 1917), and A. NETTER, of Paris (1920-1925). (See also this *Bulletin*, 1927, v. 2, 290-1).

The joint statistics of NETTER and the author yield a total of 122 cases illustrating a causal connexion between zoster and varicella, the interval ranging from 7 to 24 days.

A study of the epidemics of varicella at Budapest and the notified cases of herpes zoster during the decennium 1915-1924 shows that there is a correspondence between the rise and fall of herpes and varicella month by month especially during the period July, 1918, to October, 1921.

From a study of the literature and his own observations von Bokay is convinced that the so-called aberrant vesicles of herpes zoster are simply varicella vesicles.

The author comes to the conclusion that the identity of the ætiology of zoster and varicella has been proved in the majority of cases, although he admits that the question cannot be absolutely settled until the causal agent of varicella is identified and found in cases of zoster.

J. D. ROLLESTON.

Reprinted from "Bulletin of Hygiene," Vol. 4, *No.* 6.

i. THOMPSON, T. *Bacillus abortus* **Infection in Man.** *Lancet.* 1928, Dec. 29, 1335-8, 1 chart. [24 refs.]

ii. HARRISON, H. and WILSON, G. S. **The Possible Existence in this Country of Disease due to Infection with** *Brucella abortus. Ibid.* 1338-40. [16 refs.]

i. After reviewing the literature on *Br. abortus* infection in man and animals and emphasizing the similarity between *Br. abortus* and *Br. melitensis* and the diseases which they produce, Thompson records the seventh authentic case of human *abortus* infection occurring in Britain. The patient was a gentleman farmer, aged 33, who had an attack of unexplained pyrexia associated with rigors lasting for 3 weeks. Malaria was excluded by the absence of parasites and the inefficacy of very large doses of quinine; septic conditions by the persistent leucopenia; miliary tuberculosis by the negative radiographic examination of the chest and good general condition, and enteric by the results of agglutination tests. Complete agglutination, however, occurred with *Br. melitensis* in dilution 1 : 540, while with *Br. abortus* there was complete agglutination 1 : 860. Blood-cultures were sterile. No improvement followed administration of a vaccine containing *Br. abortus* and *Br. melitensis*, but recovery gradually took place after over three months' illness. The patient had probably been infected by cow's milk, as there had recently been an outbreak of abortion among the cattle on his farm.

ii. Harrison and Wilson examined at the Public Health Laboratory, Manchester, 998 sera, negative to Wassermann testing, for agglutinins to *Br. abortus* and found that 55 per cent. agglutinated this organism to a titre of 1 : 10 or higher, the average titre being 1 : 64. The proportion of females to males proving positive was 2 to 1. They regarded a titre of 1 : 40 which was not uncommonly found as of no significance in the diagnosis of *abortus* fever. They also examined for agglutinins to *Br. abortus* 42 sera which had proved negative to the Widal test for typhoid and paratyphoid,

and found that 26·2 per cent. agglutinated *Br. abortus* to a titre of 1 : 10 or higher. The average titre was 1 : 336. The proportion of females to males was nearly 2 to 1.

Five of the sera agglutinated *Br. abortus* to 1 : 160 or higher and came from men aged from 27 to 54 who were suffering from pyrexia of unknown origin.

The authors of both these papers suggest that blood-cultures and agglutination tests should be made on all cases of undiagnosed pyrexia and of indefinite febrile maladies.

J. D. ROLLESTON.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 6.

i. CLARK, T. Sur la fièvre ondulante aux Etats-Unis. **[Undulant Fever in the United States.]** *Bull. Office Internat. d'Hyg. Pub.* 1928, v. 20, 1394.

ii. MADSEN, T. La fièvre ondulante à *B. abortus* du Danemark. **[Undulant Fever in Denmark.]** *Ibid.* 1395-400, 1 map and 1 chart. [1 ref].

iii. KLING, C. La fièvre ondulante en Suède. **[Undulant Fever in Sweden]**. *Ibid.* 1401-7, 1 map.

i. There are two types of undulant fever in man in the United States. One is caused by *Brucella melitensis* A (BRUCE 1893, EVANS 1923) and usually contracted by drinking raw milk, the other is caused by *Brucella abortus* (BANG 1897, EVANS 1923), and is usually contracted by drinking raw milk, removing a cow's placenta or by killing pigs. The clinical symptoms are the same in both types, and the diagnosis is only made by slight serological differences. The disease has been recognized in twenty States and in the District of Columbia. The total number of notifications has been 195, of which 30 were between June 1st and December 31st, 1927.

ii. From April 1st, 1927, to April 1, 1928, all specimens of blood sent to the Danish Serological Institute for the Widal test were also examined for agglutination of *Br. abortus*. During this period 2,500 specimens of blood were received from 2,150 patients. Of these the serum of 222 patients showed characteristic agglutination of *Br. abortus* in a dilution of 1 in 100. In 27 of these cases cultures were made of the blood, and a growth of *Br. abortus* was obtained in 18. In the 9 other cases no growth was obtained, but the symptoms were as characteristic as in those which gave a positive culture. Of the 2,150 patients 172 gave a positive Widal reaction for typhoid and 126 for paratyphoid B. Infection by *Br. abortus* is therefore commoner than enteric in Denmark. In 5 of the 298 cases which gave a positive reaction for enteric, there was also an agglutination of *Br. abortus*, and clinical symptoms in these cases showed that the real infection was probably caused by *Br. abortus*. In all the other cases in which a positive

reaction was obtained for *Br. abortus* there was no agglutination of enteric organisms.

Information as to the probable source of infection was as follows :—

Probable source of infection	Town Males	Town Females	Country Males	Country Females	Total
Cattle	1	0	37	5	43
Cattle and milk ..	3	2	47	8	60
Milk	24	19	17	8	68
Uncertain	10	5	21	2	38
	38	26	122	23	209

There does not appear to have been any abnormal epidemic among the cattle during the period in question, and it is probable, therefore, that the human cases were not more numerous than before, but that febrile cases of this kind had not hitherto been diagnosed.

The age distribution showed that there were no cases under 8 years of age, and that the great majority of cases were in the male sex between 15 and 40 years of age.

Clinically the disease almost always ran a favourable course and only 4 of the 222 were fatal, but its long duration—on the average 2½ months—was a serious consideration.

Undulant fever serum was used in several cases with inconstant results. Treatment by vaccines (specific and non-specific) appeared to be more successful.

It should be added that goats are rare in Denmark, and that in no case was there any evidence that the infection was due to goats or to foreign sources.

iii. The first cases recognized as undulant fever caused by *Br. abortus* in Sweden were discovered at the end of 1927 and during the period December 23, 1927, to April 30, 1928, the occurrence of 25 cases was confirmed bacteriologically, most of them in the south of Sweden. Some cases, however, occurred in a province as far north as Jämtland.

The youngest patient was aged 11 years and the age-group most represented was that between 31 and 40 (9 cases). Men were much more frequently attacked than women (21 being males and only 4 females). At the time of publication only 11 had made a complete recovery, the remaining 14 being still feverish.

The first cases in Sweden were diagnosed by the serum test. The agglutinating power of the serum in undulant fever was much more marked than in enteric, as was seen by the fact that a distinctly positive reaction was not infrequently obtained with dilutions of 1 in 2,560 or 1 in 5,120.

Among 10 cases in which a blood-culture was made a positive result was obtained in only 3, which suggests that the organism is present in the blood in only small quantities and at certain periods.

As regards the source of infection in undulant fever in Sweden, goats are as rare as in Denmark and do not suffer from *Brucella* infection.

Epizootic abortion occurs only sporadically among pigs, whereas it is very prevalent in cattle. The geographical distribution of epizootic abortion in Sweden exactly corresponds with that of undulant fever. The source of infection in undulant fever is infected cattle or cow's milk and its products. Of the 25 patients 7 were engaged in an occupation in which direct contamination by cattle could not be excluded and the remaining 18 had been infected indirectly by consumption of raw milk. Thus while goats' milk is the chief source of infection in the Mediterranean, cows' milk occupies the same position as regards undulant fever in Sweden. As the principal source of infection has now been determined, prophylaxis is relatively simple and consists in avoiding the use of non-pasteurized milk.

In a future communication the author hopes to give an account of the results obtained by the use of a specific vaccine and serum.

J. D. Rolleston.

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Reviews.

Surgical Pathology. By Cecil P. G. Wakeley, F.R.C.S.Eng., F.R.S. Edin., Hunterian Prof. R.C.S. Eng., and St. J. D. Buxton, M.B., B.S., F.R.C.S. Bristol: Messrs Wright. 1929. Pp. xvi + 904. Price 45s.

This book gives a comprehensive survey of surgical pathology. It begins with a brief chapter on bacteriology, infection and immunity, which is followed by descriptions of inflammation, suppuration, septicæmia, and blood changes in surgical diseases.

The four opening chapters are rather condensed but fuller treatment cannot be expected in a general book of this size. Similar remarks apply to the chapter on gonorrhœa.

The chapters on tuberculosis and syphilis are good and these diseases are also dealt with as they occur in the various organs and tissues.

Tumours in general receive adequate consideration in seven chapters; two classifications of tumours are given, Adami's and a histological classification, the latter being considered the more useful.

It is stated in the preface that a work of this nature should be studied in the museum alongside actual specimens; at the same time good illustrations are helpful and the authors have made a useful selection. There are 392 in all; some are new and most of the others are taken from the *British Journal of Surgery*: they are well reproduced and the coloured ones are particularly good.

The book will be found useful not only by surgeons and pathologists but by medical practitioners in general.

HELMINTHOLOGY—MEDICAL AND VETERINARY. By H. A. Bayliss, M.A., B.Sc., Assistant Keeper, Department of Zoology, British Museum. (Natural History). London: Baillière, Tindall and Cox. 1929. Pp. xi + 303. Price 30s.

This work, written by one who is an authority on the subject, is an excellent reference book on helminthology.

The parasitic worms are of special importance to medical officers during foreign service and the fact that parasites of animals with which man comes in contact are dealt with makes the book more valuable.

The work is up to date and the nomenclature is given "in accordance with a reasonable interpretation of the rules of the International Commission in Zoological Nomenclature," so the names are not always those known to the medical student. Where a name has been recently adopted instead of one more generally known, both names are given.

The illustrations are beautifully clear: some are new and the others have been redrawn and will be found very useful in working out specimens.

In the index there are serviceable lists of the worms found in man and various animals and birds. The book should prove useful to medical and veterinary officers.

MANSON'S TROPICAL DISEASES. Ninth Edition. Edited by P. H. Manson-Bahr, D.S.O., M.A., M.D., D.T.M. and H., F.R.C.P. Cassell and Co. Price 31s. 6d.

Carlyle says somewhere that the test of a good book lies in its power to live on indefinitely without alteration or amendment, a pronouncement which proves, if such evidence were needed, that tropical medicine did not come within the purview of the choleric sage, for "Manson," the standby of generations of students, has again renewed its youth, this time as a ninth edition.

The general arrangement remains the same as before, but several chapters have been recast and much new matter added, especially in the domain of treatment. In spite of these additions and the inclusion of many new illustrations, the editor has succeeded in keeping the number of pages materially the same as before. This latest issue confirms "Manson" in its position as the best treatise on tropical diseases of its class.

A HANDBOOK ON DIABETES MELLITUS AND ITS MODERN TREATMENT. By J. P. Bose, M.B.Cal., F.C.S.Lond. Calcutta and Simla: Thacker, Spink and Co. 1928. Cr. 8vo. Pp. xvi + 192. 1 plate. Rs. 5.

From his wide experience in the subject as a research worker in the Calcutta School of Tropical Medicine, and as physician in the Carmichael Hospital, Dr. Bose has acquired a sound knowledge of diabetes from both the clinical and laboratory aspects. This small volume demonstrates that

he has the happy faculty of imparting that knowledge to the profit of the reader.

He discusses briefly the ætiology of the disease, emphasizing the part that overfeeding and sedentary habits take in producing the condition among the better-class Bengalis, and describes the symptoms and complications of diabetes with the methods of diagnosis.

His descriptions of the various tests are particularly clear and useful. He has evolved and given in detail a simplified method of estimating the blood sugar, that should be found serviceable to the ordinary practitioner.

The sections devoted to treatment are completed by tables of diets and food values.

His own scheme for a basal diet for diabetes is easy to understand and to practice.

An excellent little volume.

PROTOZOOLOGY. By J. G. Thompson, M.A., M.B., and A. Robertson, M.B. Pp. xvi + 376; with 4 plates and 220 other illustrations. Baillière, Tindall and Cox. 30s. net.

This manual is not intended for research workers, whose requirements are amply met already, but for medical men pursuing courses of study in tropical medicine, or for those working in laboratories where a sound knowledge of protozoology is necessary. The authors commence with a description of cell structure and development, and then deal with the classification of protozoa. Having prepared the ground in this way, they go on to describe the various protozoal parasites of man, group by group, as well as certain of their allies in animals, and most commendably they include detailed accounts of the pathological changes set up, thus preserving a nice association of cause and effect. The section on malaria, for example, comprises fifty-four pages, of which twenty-one are devoted to descriptions of the pathological changes in the organs and tissues, fully illustrated by excellent reproductions of photo-micrographs.

The chapter on technique is essentially practical, and embraces the collection and preparation of material, methods of staining, cultivation of intestinal and blood protozoa, and so forth, while the sections on "Fallacies and Puzzles in Blood Examination" and "Common Objects in the Stools other than Protozoa" will keep the feet of many a beginner in the narrow path. To most readers the explanatory textual notes on nomenclature will be a welcome feature, especially as the reasons underlying certain changes in generic or specific designations which have become necessary—the adoption of *Giardia lamblia* in place of *G. intestinalis*, for example—are simply given, and will help to sweeten the sorrow of parting with long familiar names.

The text is clear and to the point, the illustrations generally are excellent and the coloured plates reach a high standard of artistic merit, and the

volume bears throughout the impress of the experienced teacher. It can be warmly recommended to those members of the Corps who feel the need of some such trusty guide.

MOVABLE KIDNEY. Second Edition. By William Billington, M.S., F.R.C.S. London: Cassell and Company. 1929. Pp. ix+177. Price 12s. 6d.

This book is obviously written by an enthusiast, and for those who are interested in this subject Mr. Billington gives an excellent résumé of movable kidney, its causes, symptoms and treatment.

The operative description is very good and clear.

It must be realized that the number of cases of movable kidney associated with serious complications, such as Deitl's crises and hydronephrosis, are few in number and the psychological disabilities of these patients are of immense importance in this condition.

We believe that these psychological conditions enhance the risk of any serious operation. J. H. M. F.

PSYCHE MEDICAL MINIATURES.

London: Kegan Paul, Trench, Trübner and Co.

MIRROR-WRITING. By Macdonald Critchley. 1928. Pp. 80. Price 2s. 6d.

The problem of mirror-writing and related phenomena, such as double mirror-writing and speaking backwards, are admirably brought to a focus in this little volume. It is interesting to learn that the most ancient Greek and Latin inscriptions are written from right to left, and somewhat later ones from right to left and left to right on alternate lines, and that mirror-writers to this day sometimes write thus.

Among the physiological and pathological considerations which have to be considered are right or left-handedness, right or left "eyedness," difficulty in lateral conjugate eye movements, the natural direction for synkinetic movements which are exaggerated in hemiplegia, congenital mental defect and congenital word-blindness. Lesions of the left angular gyrus explain certain cases.

Backward speech is rare, and usually depends on an organic cerebral lesion, but may symbolize negativism in certain mental disorders.

The author is to be cordially congratulated on a most interesting contribution to neurology.

THE TROUBLED CONSCIENCE AND THE INSANE MIND. By C. Blondel. 1928. Pp. 91. Price 2s. 6d.

Professor Blondel is here concerned with the genesis of the bizarre and deleric utterances so often met with in the insane, which turn upon delusions of ill-health or bodily abnormality. He develops the theme that they may be explicable by the obtrusion into the sphere of the collective social

consciousness of some abnormality in the visceral feeling tone. This latter is essentially individual. It is very inarticulate, even when normal, and still more so when deranged.

The author suggests that when an insane patient of the type here considered says, for example, that a black ball passes in a certain direction through his head, he is attempting to describe an effect upon consciousness caused by some distortion of visceral feeling which speech is utterly unsuited to express. These patients are frequently very loquacious, for ever, according to this view, pursuing the hopeless quest of finding verbal forms wherewith to express what seems to have happened to them.

This thesis is interesting and stimulating, and is ably dealt with in these two essays. One might perhaps ask what, on this view, is the difference between the thus grotesquely and grossly deluded subjects and the non-deluded hypochondriac. There seems to be more than a mere difference in degree between the two classes of patient.

There is no doubt that the representation of the body in the mind is a mysterious attribute from all points of view.

These two essays are excellently translated, and the translator, who has expressed in the past views very similar to those here developed by Professor Blondel, contributes a luminous introduction.

MESCAL, THE DEVINE PLANT AND ITS PSYCHOLOGICAL EFFECT. By Heinrich Klüver. 1928. Pp. 111. Price 2s. 6d.

Mescal is a drug the pharmacological action of which is to stimulate the cerebral cortex, and notably the visual and visuo-psychic areas.

The result of exhibiting the drug is apparently a strange conglomeration of ecstatic visions of riots of indescribably beautiful coloured patterns and cloud-vast structures, aura-like sensations dependent on the irradiation of one sense-perception into another, and mental symptoms reflecting states met with in the psychoses. Insight is not abolished.

Owing to the specific effect of the drug on the optical sensorium, it is considered capable of furnishing an instrument for investigating the psychology of visual perception and related matters. The author's ideas rouse visions of a dim future when physiologists will have means of temporarily inhibiting or enhancing the function of this or that layer of the cerebral cortex, this or that nucleus of the thalamus, or any part of the brain at will, and when neurology and psychology will indeed be on the march!

These three little volumes of the medical series of the Psyche Miniatures are bound and got up in the usual neat and attractive manner.

H. G.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

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Journal

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Original Communications.

THE EVACUATION OF SICK AND WOUNDED BY AIR.[1]

By GROUP-CAPTAIN HARDY V. WELLS, C.B.E., K.H.P.,
Royal Air Force.

(1) HISTORY.

AIR AMBULANCE CARRIAGE has been used with success by various countries both in peace and war.

In England, since the War, it has not yet been used on a large scale owing to hospitals being somewhat easily accessible, but when aerodromes are available in outlying districts this method will obviously come more into use. In our Air Force we use it where flying stations are situated at long distances from our hospitals, or where we consider air carriage is preferable to other means.

In the East we use it as the means of evacuation. In Iraq since 1923 it has been the regular method, and it is the only means of rapid transfer in that type of country. It has proved extremely valuable in war operations, both in the desert and in the hills.

In England it was not until the year 1919 that we turned our attention seriously to this type of transport for casualties.

I can find no history of the regular employment of air ambulance by Great Britain in the Great War.

(2) TYPES OF AIRCRAFT CAPABLE OF AMBULANCE CARRIAGE.

Before we consider the carriage of casualties by air we must know our requirements, and what type of aircraft is suitable, as, owing to designs of aircraft differing, some types are not suitable.

[1] The second paper read at the Fifth International Congress of Military Medicine and Pharmacy, London.

Requirements.—We can definitely say all aircraft for such transport must be capable of taking a case lying down, and that is to accommodate a stretcher and fittings for securing the stretcher. It must also have an opening so that a patient can be placed within while in the lying position.

TYPES OF AIRCRAFT SUITABLE FOR CARRIAGE OF CASUALTIES.

These are:—

(1) Aeroplanes of the various types, including Seaplanes and Flying Boats.

(2) Airships.

In this paper it is only proposed to deal with the former; these are divided into the larger and smaller types.

Larger Types.—Those with a large and roomy fuselage, or a large hulled flying boat. They must have an opening whereby lying cases can be placed inside; this opening can be by a side door or an opening in the nose of the aircraft. It is better to have a side opening as handling is easier, but when it is undesirable in certain types, such as flying boats, to interfere with the hull, cases can easily be lifted over the side.

Smaller Type.—Those of the two-seater type, and which are capable of using landing grounds which are unsuitable for the larger aircraft. These usually are incapable of accommodating a lying case owing to the cross bracing wires of the fuselage, and it is not possible to alter this, as the bracing wires are an important part of their design. Aircraft of this type capable of taking a stretcher can be so designed that there are no cross bracing wires. This is brought about by using the system of hoops. Such types of aircraft, built by a British firm to accommodate a stretcher, are already in use; the means of entry is by removal of the cowling on the upper surface of the fuselage. A stretcher is then easily lowered in, and the cowling replaced. We have such a machine in the Fairey III. F.

Carriage outside the Fuselage.—You can, by means of a special stretcher of the Neill Robertson type, strap a patient to the upper surface of the fuselage. This method can only be used in emergencies, and when other means are not available.

(3) USES AND LIMITATIONS OF AIRCRAFT.

The transfer of casualties by air is the quickest and most comfortable method. It is particularly valuable where military operations are at a distance from the Base, and in countries where transport by road, rail or water is difficult, or almost impossible, without a great deal of organization on the route.

The Great War has shown us the importance of early surgical treatment of those grave wounds of the abdomen, head and chest, and we know that unless such treatment can be given within six to eight hours the chances of saving life are proportionally decreased. Land transport is often slow and cannot be depended upon ; therefore, it is in the interest of

life that we should use the air. Experience has shown us that all types of cases can be taken by air, and obtain benefit by the skilled treatment they can receive in a well-equipped hospital. By use of the air central hospitals will in the future be able to deal with patients from wide areas, and this will be a distinct saving in hospitals and staff.

Limitations.—These, in regard to removal of casualties, are few, and can be put down as:—(1) Weather conditions; (2) Landing Grounds.

(1) *Weather Conditions.*—Gales of wind which might cause the patient too much discomfort, and fog or sand storms; the latter also delay road transport. You can afford to wait when using the air, as your means are quick, and weather reports will help you.

(2) *Landing Grounds.*—It is essential there should be landing grounds reasonably near to your hospitals, and it must be known for what type of aircraft your aerodrome is suitable; the larger machines require a bigger aerodrome, and, therefore, you cannot expect these to use an aerodrome only suitable for the smaller type.

You must, therefore, site your hospitals reasonably accessible to a landing ground or preferably to an established aerodrome. Landing grounds may be temporarily unfit for use owing to heavy rains, but usually not for long, at any rate for the smaller type of aeroplane.

(4) The Flying Ambulance.

Under this heading we must include all aeroplanes that are capable of accommodating a lying case, and we should call them "Ambulance Carriers."

The most convenient type of air ambulance should be capable of carrying two or four lying cases and one hospital attendant. We don't want to carry a medical officer; he can do no more in the air than a well-trained medical orderly. The orderly should form one of the crew and be responsible for the necessary medical equipment.

Fittings in the Ambulance Aeroplane.—Should consist of: Stretcher fittings, and with means of securing the stretcher. Seats of collapsible type for sitting cases and for an attendant. Small water tank.

A small cabinet or box for dressings or first-aid equipment. A latrine is not necessary, but a metal funnel let in the floor is most useful for emptying excretions.

(5) Equipment Carried.

Stretchers.—The choice of these is at present limited by the agreement between the Navy, Army and Air Force to employ only a common standard type of stretcher. This has many advantages, but I foresee, however, that the stretcher of the future for air work will be a light metal stretcher which will be adjustable to fit all forms of ambulance transport.

Straps for securing the patient must be fitted to the stretcher.

Blankets.—Two for each stretcher.

Pillows.—One for each stretcher.

Hot Water Bottle, Urinal, Bed Pan and Drinking Vessels of Feeder Type.—All these utensils should be of a light metal.

Suspension Bars for Thigh Splints.—In Iraq we found that the Suspension Bar for Thomas' Splint was too high, and therefore a smaller type was brought into use.

(6) Administration, Control and Supply.

Air carriage of casualties in warfare can only be satisfactory provided suitable aircraft are definitely available for this work, and under the direct control of those responsible for the removal of casualties. Aircraft designed and fitted for war purpose, even though convertible for use as ambulance carriers and used as such in peace time, are not specially suitable for this purpose in war, and, moreover, are unlikely to be available for ambulance work on the outbreak of war.

On the outbreak of war, therefore, we should certainly have to construct ambulance machines, and until they were ready we should have to rely on casual sources of supply such as troop carriers and heavy transport aircraft when not employed on air operations.

(7) Pilots and Crews.

These must be supplied from somewhere. We could not rely on many service pilots, but with the great increase in civil flying there should be ample supply of those pilots for this purpose, and later, pilots who require a rest from the stress of air warfare could be employed on this work.

(8) Employment.

This depends on the type of the war, and we must therefore divide our wars into: (1) Great War; (2) Small War; (3) Tropical War.

(1) *Great War.*—When large armies are in contact the areas adjacent to the front line will be continually under shell fire, and therefore employment of aircraft on ambulance work in this area will be impossible. The nearest position for such work will be somewhere out of this area, and that brings us to the vicinity of the advanced mobile hospitals.

Your landing ground should be reasonably adjacent to these mobile hospitals. A connecting light railway would be of much assistance. You could not expect to clear large numbers by air, but you could send down to your stationary or base hospitals those serious cases which crowd up your clearing hospitals, and those would include wounds of abdomen, chest and head which were received early enough to pass on for operation. Shattered thighs, after temporary repairs, could be early got away.

During quiet periods you could clear by air post-operative cases by this quick and simple means.

The base or stationary hospitals also should have an aerodrome reasonably adjacent and should be connected up by a light railway.

(2) *Small War.*—For this purpose we must assume a force operating from an established base, with columns moving up. It is therefore necessary to transfer casualties from the Field Ambulance to a stationary or base hospital by the quickest method. Such a force would have aircraft with them, and these would establish advanced aerodromes or advanced landing grounds. These would be utilized for ambulance aeroplanes. If the distance from the base to column was very great it would be necessary to establish an advanced hospital, as a journey over two hours by air would be inadvisable without some attention to the patient. If a waterway is available seaplanes or flying boats could be used, and form a connecting link with land planes. The main object of air carriage in such a type of warfare would be to avoid establishing advanced hospitals by moving your cases direct to your base hospitals.

The air method is also extremely valuable where the intervening country is unsafe, and further, if a force is besieged you could remove the serious cases by air provided the besieged force could defend a suitable landing ground.

Under the heading of Small War we must consider the situation where mechanized forces may be operating at long distances from any base or main force, and unless they carry their serious casualties with them, either in a mechanized field ambulance or otherwise, the only means of transfer to a hospital is by air; here air ambulances of the smaller type would be invaluable.

(3) *Tropical War.*—The removal of casualties in tropical warfare is always one of difficulty, and unless waterways are available it means carriage long distances through narrow bush tracts or other ground. This is a long and tedious business and subject to interference by hostile natives and even wild animals. Resting stages have to be established at numerous places. Water or suitable food may be difficult to obtain, and flies, mosquitoes and other insects are a real pest. You may have to take your wounded along with you, a heavy encumbrance to a fighting force.

There is only one way out of this and that is air transport. It is always possible to get a clearing or some suitable place for a landing ground for the smaller type.

(9) Combined Operations.

It is important there should be a clear understanding as to the responsibility for the evacuation in combined operations.

This point should be decided before the operations are undertaken, but if this is not possible it must be left to the commanders of the service to decide.

(10) Removal of Wounded to Hospital Ships.

It is assumed that the line of demarcation of the Naval and Military responsibility in the handling of wounded has been defined before landing.

The actual distance of the line of demarcation can only be decided on the spot. If wharves or jetties are available it will be the duty of the land or air forces to take their casualties to these or other settled embarking places.

(11) Inland Waterways.

Where operations are in the vicinity of estuaries and rivers and casualties can be brought down by small river craft or by aircraft capable of landing on water, the question as to whether these can go direct to hospital ships will depend on the local conditions, and to a great extent on the weather conditions. This point will have to be decided by the naval authority in regard to water craft and probably also in regard to aircraft, but it is probable the latter would land in the calm water of their selected base and transfer their casualties either to land or water craft, and therefore they would then come under whichever authority was responsible.

In regard to aircraft employed on such services, this means must be left to the Air Force control until they actually hand over their casualties to one or other of the services.

(12) Protection under Red Cross.

Aircraft solely employed in ambulance work should come under the protection of the Red Cross, but a difficulty would always arise as to identification of such aircraft, both from the air and the ground.

A large Red Cross on the upper and lower surface of each plane might be seen in clear weather, but this would not be easy, especially when visibility was poor.

It seems better to paint the whole aeroplane a red colour and pick out a red cross with white edges.

At night, navigation lights and possibly special identification lights as are used by hospital ships would afford protection.

It would not be practical to restrict ambulance aircraft to any particular height or any particular route.

TROPICAL FEVERS OF SHORT DURATION.[1]

By Lieutenant-Colonel W. P. MacARTHUR, D.S.O., O.B.E., M.D., F.R.C.P.I.,
Royal Army Medical Corps,

Surgeon Commander S. F. DUDLEY, O.B.E., M.D., D.P.H.,
Royal Navy,

and

Wing Commander H. E. WHITTINGHAM, M.B., F.R.F.P.S. (G.), D.P.H., D.T.M. & H.,
Royal Air Force.

The obscure short fevers of the tropics fall into two main groups :—

(1) Atypical or abortive attacks of known diseases.

(2) Fevers which have still to be described.

The closer the co-operation between the clinician and the pathologist, and the more searching their investigations, the smaller will be the proportion of cases finally allotted to the second group.

Mild and aborting enteric and paratyphoid fevers, particularly when modified by foregoing inoculation, have been found masquerading under a variety of local names; in one district a short fever known as "coast fever," and usually considered a distinct entity, was shown by one of us to be merely mild enteric and paratyphoid fever. This applies also to undulant fever, and indeed to any febrile disease where infection is reduced to the lowest degree of virulence and the patient in a state just short of complete resistance.

The initial attack of simple malaria may be characterized by a short continued fever, without the classical paroxysms of the disease, and at this stage parasites may be sparse in the peripheral blood, and exceedingly difficult to detect; this type of onset caused considerable diagnostic difficulty in the Shanghai Defence Force, especially as the locality was stated to be malaria free, and early cases were regarded as possible examples of a condition known there as "Shanghai Fever" until their true nature was determined.

Yet another variety of short fever common in the tropics appears to be due to a disturbance of body metabolism by heat, and evidenced by a febrile reaction short of heat stroke; crops of such short fevers may be encountered particularly after children's parties where violent games have been played under a hot sun, an experience which recalls the opinion held by some tropical practitioners of the old school, that in many cases of enteric fever the disease can be cut short at the beginning by a sharp purge.

Dengue and phlebotomus fever are recognized by most authorities as definite short fevers, although, when analysed, they are so far from being definite that attempts to estimate the immunity to second attacks are unsatisfactory owing to confusion with clinically similar types of fever. In Malta, where there is very little indigenous malaria, only about 10

[1] Paper read at the Fifth International Congress of Military Medicine and Pharmacy, London.

per cent of visitors to the island suffer from second attacks of phlebotomus fever, so that supposed recurring attacks of phlebotomus fever elsewhere probably indicate mistaken diagnosis, the real infection being malaria, relapsing fever, enterica or undulant fever, occasionally hepatic amœbiasis. In this connexion it may be stated that frequently those persons showing considerable dermal reaction at the site of phlebotomus bites do not contract the fever; this fact suggests an immunity akin to fixation abscess.

Influenza, even in the tropics, is a source of diagnostic confusion, for the coryza may not be a deciding factor, and, though the relative lymphocytosis of influenza chiefly concerns the small variety, while that of phlebotomus fever and dengue is of the larger type, the expected working error in the technique of blood-counts is sufficient usually to nullify aid in this direction. At times outbreaks of phlebotomus fever show as early symptoms, colic, diarrhœa, pharyngitis or bronchitis, and are apt to be mistaken for cases of dysentery or influenza. Inquiries into certain of these outbreaks have revealed the fact that patients who presented these leading symptoms had suffered, at some little time previously, from either dysentery or naso-pharyngeal catarrh. The reappearance of these symptoms may be explained as arising from a general congestion of the body which picks out the weakened parts; the congestion being produced partly by the vasodilatation which accompanies phlebotomus and other fevers, and partly by the hot humid atmosphere which occurs frequently during the phlebotomus season.

Recent investigations have shown the importance of spirochætosis as a cause of short fevers in various tropical countries. A series of leptospira, whether distinct species or only variants of the same, can give rise to fever of a variety of types; the fever may be insignificant and never reach 100° F. or may be more marked, lasting three days or longer, and run a continuous, intermittent or saddle-backed course, with or without relapses. The more severe infections show jaundice, sometimes of a toxic hæmorrhagic type. Injection of the conjunctiva and a trace of albumin in the urine seem to be constant signs even in the milder cases. In some of the Malaya series the symptoms were so like dengue that Fletcher considers that some part of the dengue recorded there is really spirochætosis. Leptospira can readily be isolated from the blood during the first seven days of the disease, and from the urine from about the fifteenth day to the twenty-fifth. The relationship of the various leptospira isolated in such infections is the subject of controversy; some workers consider that they all represent one species of free-living spirochæte, acquired in the first place probably from contaminated water, the variations in virulence and in reaction to serological tests being produced by differences in passage, soil, temperature and humidity. Others hold that a series of different species of leptospira is involved, and to these supposed species distinctive names have been given. It is wise perhaps at the present stage of knowledge to be conservative and look upon all leptospiral infections as probably representing gradations of Weil's disease.

The question arises, is there any simple practical method by which the average worker can distinguish the more severe forms of phlebotomus fever and dengue from the milder cases of Weil's disease, other than by cultural and animal inoculations. Fortunately there is. One of us carried out lengthy investigations into the blood-pictures of the pyrexias commonly met with in the tropics. The results obtained in many cases simply confirmed the findings of other investigators. Briefly, if the fever is of acute onset, and provided the examination of blood-films has excluded the presence of the malaria parasite, or the spirochæte of relapsing fever, then a leucopenia with a relative increase of large lymphocytes points to phlebotomus fever or dengue, whereas a leucocytosis accompanied by an absolute and relative increase of the polymorphonuclears suggests that the pyrexia belongs to the Weil's disease group.

The leucopenia (4,000 per cubic millimetre) lasts for the first three to five days of disease, followed by a leucocytosis shooting up to 15,000 to 20,000 per cubic millimetre, on or about the tenth day of disease. This leucocytosis is transient and disappears in the course of two or three days. The lowest point in the leucopenia occurs six to nine hours after the onset of the pyrexia and is a useful aid to early diagnosis. The differential leucocyte count shows a decrease in the number of polymorphonuclear leucocytes, and an increase of the lymphocytes, especially of the large variety. The eosinophils disappear during the fever and return with defervescence. A late eosinophilia in dengue has been described; it is more commonly seen in Egypt and the Far East than in the Mediterranean littoral—in other words, this post-dengue eosinophilia is found in areas known to be heavily infected with helminthic disease, and may merely indicate a return of the blood picture to its pre-febrile condition.

Furthermore, as Young in West Africa showed, Weil's disease can be distinguished from yellow fever by estimating the amount of albumin in the urine even during the first forty-eight hours of illness—a large amount of albumin indicates yellow fever. Thus a case of suspected Weil's disease showing a solid clot of albumin when submitted to the boiling test is in reality one of yellow fever, and conversely a supposed yellow fever patient with little or no albuminuria is probably suffering from Weil's disease.

The difficulties in sorting out the true undifferentiated short fevers are intensified by an unwillingness to acknowledge failure; this is particularly in evidence in Government services where those responsible for hospital records sometimes prefer a doubtful or even an erroneous diagnosis to none at all. But when every known and available diagnostic test has been tried thoroughly without result, the pyrexia in question is really one of "unknown origin," and this label should be applied, instead of knowingly or subconsciously elevating to causal rank some sign that is only a result of the unknown infection, for at present the "tonsillitis" of one station may be equivalent to the "myalgia" of another, and to the "sandfly fever" of a third, all really representing the same undetermined disease.

RECENT ADVANCES IN THE TREATMENT OF GONORRHŒA.

By Major CHARLES WHITE, O.B.E.,
Royal Army Medical Corps,

AND

Major H. G. WINTER, M.C.,
Royal Army Medical Corps.

It is universally realized that gonorrhœa presents a problem which medical science has hitherto failed to solve. The authors of this article do not claim to have produced a certain and rapid cure, but they do claim that research work at Woolwich during the past three or four years has opened up an entirely new field for investigation, and may go far towards revolutionizing vaccine treatment as a whole.

To the brilliant brain of Major Lyn Dimond, R.A.M.C. (T.) is due the whole credit for the inception of the theory, and for the bacteriological and biochemical side of the work.

The history of these discoveries begins with the failure of kataphoresis as a treatment for gonorrhœa.

Major Dimond had concentrated on this method and, when it was found that, although theoretically sound, practically it was unworkable, he concentrated on the metabolism of the gonococcus and its biochemical reactions. As a result of his researches in this direction he evolved the theories set forth below and, further, carried them into practice.

Major E. C. Lambkin, who at first carried out the practical work on cases of gonorrhœa in conjunction with Major Dimond, published two papers—one in the Journal of the Royal Army Medical Corps in March, 1925, and another in the *British Journal of Venereal Diseases* in January, 1926, and also read a paper before the War Section of the Royal Society of Medicine in the summer of 1926. Otherwise nothing further has been made public. The present authors having tested the treatment in 1,018 cases of gonorrhœa for a period of over two years, consider they are justified in reporting their results in order that others may work on the same lines and confirm or reject the conclusions come to.

Work has largely, and of necessity, been done chiefly with the gonococcus, but vaccines have been prepared by this method from other organisms and have been used with most excellent results. Notable amongst these are: Pneumococcus, of all types, tubercle bacillus, streptococci, staphylococci, *M. catarrhalis*, *B. coryza segmentosa*, etc.

The original aim was to produce a vaccine which, whilst free from toxin, was at a maximum in antigenic power. It was known that heat

destroyed toxin, but at the same time destroyed antigen to a somewhat less degree. It was realized early that the best way to overcome this difficulty would probably be to prepare a vaccine which was entirely free from organisms—a solution of antigen alone—this is in fact what was actually accomplished.

Work was commenced with exhaustive and extensive considerations of the biochemistry and metabolism of the gonococcus, and it was found that what was applicable to this organism was equally so to others.

It is a well-known and established fact that all organisms have a minimum, maximum and optimum temperature for growth, but Major Dimond went further; his researches forced him to the conclusion that there was also an optimum alkalinity of the medium. The optimum for the gonococcus corresponds to a pH of 7·2. When grown on a medium suitably buffered to remain at this pH, the gonococcus is in its vegetative form, it is luxuriant in growth and very virulent, but is most vulnerable to destruction either by chemical means or phagocytosis.

If the medium, either *in vivo* or *in vitro*, is allowed to become acid, say to a pH of 6·8, the organism tends to lose its kidney-shaped diplococcal form, divides in all planes and forms morulæ of 4, 8, 16, 32, etc. The gonococcus also becomes more basophilic in its staining reactions and, what is much more important, forms round itself a mucin envelope. This envelope consists of a scleroprotein, is chemically a glucosamine, and is identical with the chitin of lobster and crab shells; it is insoluble in anything but the strongest mineral acids. In this form the gonococcus is virtually encysted, and although inactive is very difficult to destroy, either by heat, chemicals or phagocytosis. This would largely account for the chronicity of the disease, and for the fact that a case may be infective even after apparent cure.

On the other hand if the medium is allowed to become alkaline to a pH of 8 the gonococcus begins to swell and large forms appear; this would probably account for the occurrence of the so-called "giant gonococcus," previously considered to be a separate entity. In an alkaline medium also the organism commences to autolyse, thus releasing its endotoxin and accounting for the toxic symptoms which are liable to occur during the course of the disease.

A word here may not be out of place regarding the endotoxin. This substance would appear to be an end-product of metabolism—an excretion, in fact. Biochemically it is a deutero-albumose, the last phase in protein metabolism, before breaking down into purin bases and amino-acids.

As a result of early research, the theory was evolved that the bacterial antigen was a histone, or, if not actually a histone, was very closely allied to it. Body immunity was considered largely to depend on the reticulo-endothelial system. It is believed that the large macrophage cell is the true phagocyte of the body and that immunity is largely cellular rather than chemical.

It was discovered that when the gonococcus, or for the matter of that, any other organism, was grown on a medium rich in nucleo-protein, it tended to produce polar bodies which were loosely attached to the organism; these bodies stain black with Neisser's stain, and are easily distinguishable. They were found to consist of equal parts of α-nucleo-protein and β-nucleo-histone, the latter portion being soluble in 2 per cent salt solution.

Whilst working with this special medium it was also discovered that the histone present in the medium united with the gonococcus protein and fixed it in an insoluble form at the meta-protein and primary albumose stage, thus preventing the formation of the deutero-albumose or endotoxin.

The question now arises, how are these facts to be made use of clinically? It would appear that the first thing would be to bring the patient's body fluids to a pH of 7·2, and keep them there so as to cause the gonococcus to be most vulnerable. It is interesting to note also that at a pH of 7·2 the body is at its optimum to withstand infection, phagocytosis being at a maximum; on the acid side phagocytosis is at a minimum.

As an index of the alkalinity of the body fluids urine tests were employed and it was found that the average in a series of untreated gonorrhœa cases was pH 6·8. In an attempt to alkalinize the patients a number of salts were tried. Any alkali containing CO_2 is contra-indicated as this is utilized by the gonococcus in its metabolism and in the formation of the mucin envelope—a condition to be avoided at all costs. Finally the alkaline sodium phosphate was chosen and the authors see no reason for changing it.

There are three phosphates of sodium—the basic salt or trisodium phosphate which is rarely, if ever, used in medicine; the acid salt or sodium dihydrogen phosphate, commonly used as a diuretic and, in conjunction with urotropin, as a urinary antiseptic; and *the alkaline salt or disodium hydrogen phosphate.* It is the latter salt which is used.

Large doses are required and as a routine half an ounce is given four times a day; this dose is just soluble in six ounces of water. No ill effects resulting from these large doses have been noted with the exception that at first a few patients complained of diarrhœa; the addition of ten minims of tr. hyoscyamus to the dose was found to be sufficient to prevent this complication.

On these doses—two ounces per diem—the average man's urine remains at a pH of 7·2. Individuals differ and some require slightly more or less; a check is kept by roughly estimating the urinary pH every morning; 0·2 per cent phenol red is used for this purpose.

In a normal individual, the mineral content (chiefly calcium) of the body is kept at a more or less constant level and any excess is excreted chiefly by the kidneys. Calcium is required in body metabolism and is closely bound up with the vitamins and with immunity. A simple test as to calcium sufficiency is by urine examination.

It was found that patients on large doses of alkaline sodium phosphate failed to excrete calcium in the urine, and the natural supposition was that

they were being "demineralized" by excretion of calcium and magnesium, etc., salts through the bowel. It was therefore apparent that these salts must be replaced. This can be accomplished in a cheap and efficient manner by saving all the water in which the vegetables for hospital diets are boiled and making it up into a palatable soup with marmite or stock. Patients like this and, given twice a day, it supplies all the mineral salts in the correct proportion required by the body.

Having brought the patients' urine to a pH of 7·2 it now remains to deal with the infecting organism. This can be accomplished either directly by local application of chemicals or indirectly by stimulating the tissues to destroy them.

The urethral mucous membrane is a very delicate structure and the gonococcus buries itself very deeply in it. It naturally follows that no chemical can destroy the organism without also destroying the mucous membrane; this is not only useless but harmful. The authors have formed the opinion that the majority of irrigating fluids are used in too great strength and further that a large proportion of cases of posterior urethritis are due to the administration of anterior irrigations only. In treatment in this clinic nothing stronger than $\frac{1}{2000}$ potassium permanganate is used and posterior irrigations are insisted on. The irrigations are merely used as a mechanical means of cleansing the urethra by clearing out discharges. By this method it has been found possible to commence irrigations on the first day in the most acute cases, with excellent results.

So far nothing has been said about the actual destruction of the gonococcus; the procedure described above has merely been that necessary to place the body in an optimum position to deal with the infecting organism and it only remains to describe the steps taken to destroy it.

The culture media used—described in detail in an appendix at the end of this paper—were found to be of exceptional value. The growth of all organisms, even the tubercle bacillus, is extraordinarily prolific and rapid. As an instance it may be stated that the gonococcus has been kept alive without subculture for eighteen months and two years—a statement which may appear incredible to those workers who know the difficulty of growing the organism at all. Moreover all vaccines at present used are prepared from two strains which were isolated in the early days and are still growing strongly.

The routine preparation of the vaccine is as follows: Large $6 \times \frac{3}{4}$ inch tubes of the nucleo-protein medium are inoculated with gonococcal culture and are incubated for twenty-four hours. In order to ensure uniform growth, the same sized tubes, sloped to the same angle, and a standard inoculating loop are used. After twenty-four hours, each tube is washed off with 1·5 cubic centimetres of 2 per cent saline carbolized with 0·5 per cent phenol—a separate pipette is used for the addition of the saline and for removal of the emulsion from the tubes, thus ensuring that the stock carbolized saline is not contaminated with gonococcal bodies which might autolyse on standing and release their endotoxin.

The emulsion is put up in vaccine bottles in quantities of twenty-five cubic centimetres. Periodical counts show the average content to be $7{,}000 \times 10^6$ per cubic centimetre. These bottles are put, with the least possible delay, in a high speed centrifuge giving 9,000 revolutions a minute and are "swung" for about four minutes. After centrifugalization it will be noted that the contents have separated into three layers, a lower greyish layer consisting of the bodies of the gonococci, a middle cream-coloured layer of the α-nucleo-protein element of the polar bodies and a clear supernatant fluid which is a saturated solution of the β-nucleo-histone in a two per cent carbolized saline. This clear fluid is pipetted off and put in vaccine bottles ready for use. It is not heated. The solid portions might be removed by sedimentation, but high-speed centrifugalization is resorted to because it has been found that the shorter the period the diluting fluid is left in contact with the organism, the less likely is autolysis to take place. Vaccine prepared in this manner will keep well for considerable periods and under varying conditions of temperature, still retaining its antigenic power. The dosage is two cubic centimetres and the optimum interval between doses is six days.

The method of administration is of some interest. We believe that body immunity depends largely on the stimulation of the lymphatic system and that, if a vaccine be given subcutaneously, intramuscularly or intravenously, a large proportion will be excreted before it has been able to exert its antigenic power. Moreover there is a definite danger of thrombosis when saturated solutions of nucleo-proteins are introduced into the blood-stream direct.

For these reasons the vaccines are given intradermally. A dose of two cubic centimetres is, however, too big to administer by this route in one site, it is, therefore, distributed over seven areas as follows: inner and outer wall of the axilla on each side, inner side of both thighs and into the skin at the base of the penis. Provided a fine, sharp needle is used no difficulty is experienced and very little pain felt. The results of the vaccine are a slight local reaction and enlargement of lymphatic glands.

It is interesting to note that large macrophage cells increase in the urethral discharge and differential blood-counts show an increase in the large hyaline cells from a normal of 4 per cent to 40 per cent or 50 per cent as a result of these inoculations.

During the course of the disease no instrumental interference is resorted to unless symptoms appear to warrant it. In fact the majority of primary cases are not touched until before being discharged from hospital, when they are examined by the urethroscope or straight sound and by prostatic massage.

Under this treatment it has been found quite unnecessary to keep patients in bed on milk diet, and, unless complications are present, they are all treated as "up" patients and put on ordinary diet.

To summarize shortly the routine treatment:—

On admission to hospital a smear is taken and if positive the following procedure is carried out:—

(1) Half an ounce alkaline sodium phosphate is given four times a day.

(2) Two *posterior* irrigations a day are given with $\frac{1}{20000}$ pot. permang.

(3) Two cubic centimetres polar body vaccine are injected intradermally in seven places. This is repeated every seventh day for as long as required.

(4) Daily smears are examined and the approximate number of pus and endothelial cells and gonococci are estimated (the numbers are recorded as approximately the number per field, i.e., "G.C. 2/1, P. 4/1, E.P. 1/10").

(5) A rough estimate of the urinary pH is made daily.

(6) The patient is kept "up" on ordinary diet with the addition of vegetable soup twice daily and four pints of barley water (made without lemons).

(7) Two or three times weekly the patients are assembled in the treatment room and their urine examined by the two-glass method. It has been found that, in view of the large amount of phosphate present, glacial acetic acid is frequently required to clear it. It is not suggested that the two-glass method is infallible but, if one method is adhered to, after some experience a good deal of information can be obtained.

(8) Immediately the discharge begins to lessen, irrigations are cut down to one a day and later discontinued. Patients are put on light fatigues at the earliest possible moment.

(9) When a patient has been "dry" for seven consecutive days on no treatment and on light fatigues he is examined with the urethroscope or straight sound and by prostatic massage. If no evidence of disease is discovered he is discharged from hospital to duty but is kept under observation for six weeks to two months, reporting at first weekly, later fortnightly.

(10) If, during the course of treatment, complications, such as acute posterior urethritis, develop, the patient is put to bed on a low diet with the appropriate treatment. Irrigations are stopped but the vaccine is continued. In fact the treatment of complications is the same as heretofore with the addition of vaccines and sodium phosphate.

In the early days much work was done with the gonococcus endotoxin. It was, moreover, originally thought that only about a third of the gonococcus strains were capable of producing polar bodies on suitable media. Improvements in the media and the technique now make it apparent that in all probability all strains can be made to produce these bodies, although some strains are far more prolific than others.

To produce a solution of endotoxin, a strain of gonococcus giving a poor yield of polar bodies is selected and this is grown for a week on the ordinary isolation medium without nucleo-protein. The growth is then washed off with normal saline and this is standardized to contain 250×10^6 per cubic centimetre. The emulsion is repeatedly frozen and thawed to ensure complete autolysis. To this solution, which is an opalescent fluid, is added a small proportion of chemically prepared colloidal silver as a preservative.

It was realized that this was the most reliable test of cure yet produced. One cubic centimetre instilled into the urethra has no effect on the normal man or on a patient suffering from a non-gonococcal urethritis, but if there are any living gonococci present it will precipitate an acute attack in three to nine days. It is in fact reliable and selective in action.

Observation on the use of endotoxin as a test of cure in a large number of cases goes to show that, whereas if no reaction occurs within ten days of its exhibition the case may reasonably be considered free from gonorrhœa, if reaction occurs, the resultant attack is resistant to treatment and is liable to become chronic, the toxin is very virulent and throws the patient into what is apparently a negative phase. For this reason the authors do *not* recommend the use of endotoxin as a *routine* test of cure in the ordinary cases of gonorrhœa, but consider it is most valuable in the "end" or "marriage test" when some months or years have elapsed after the actual attack of gonorrhœa.

A word is necessary as regards nomenclature. The polar bodies are identical with those described by Babe and Neisser, and have therefore been called "Babe bodies." The original name of "endotoxin" is a good one, as this is a true endotoxin, but the name of "exotoxin" for the vaccine is misleading as it is in no sense a toxin. Ecto-antigen might be a better name.

Conclusions.

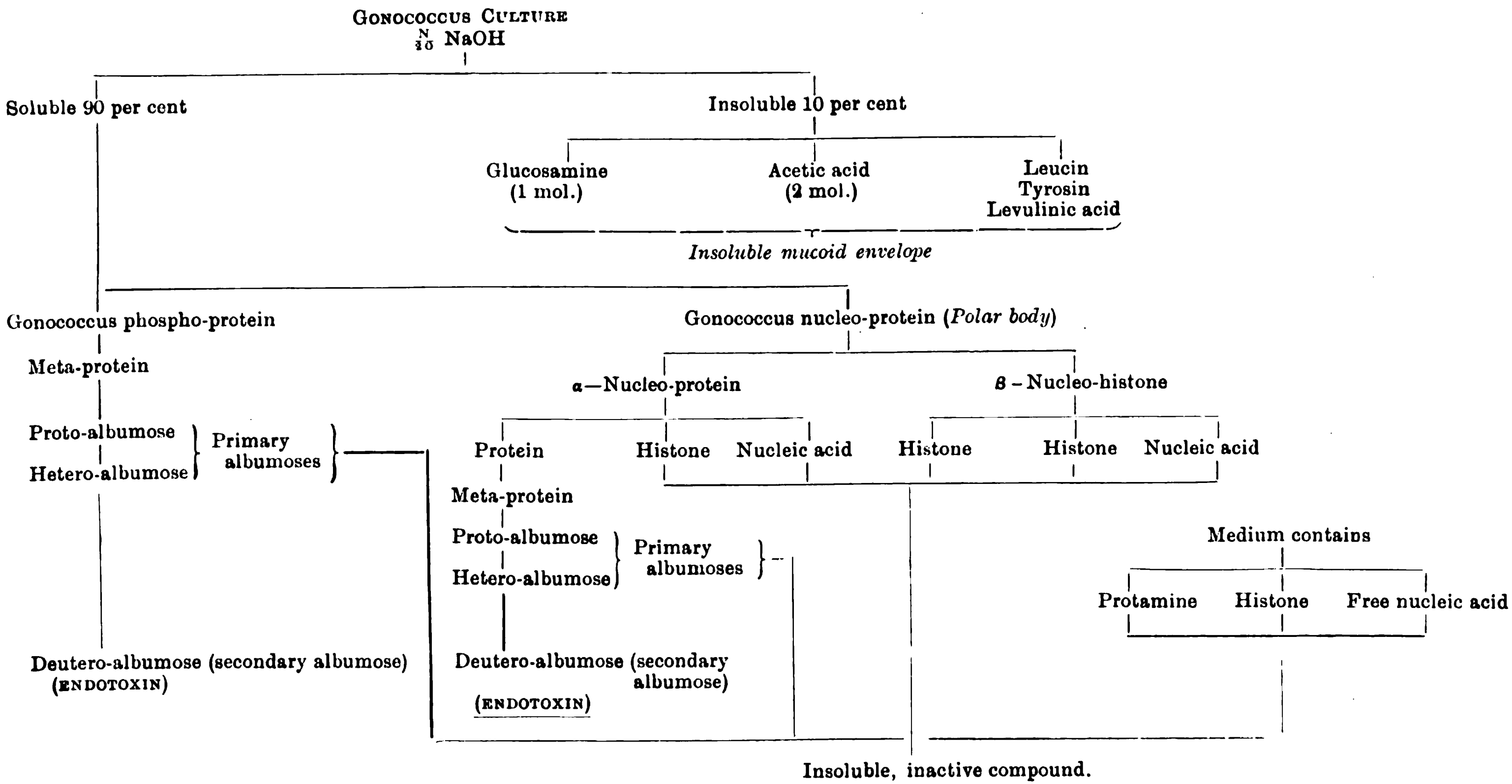
Without being unduly optimistic, the authors and all who have worked with this method of treatment are convinced of its efficacy. So far it has only been used in male gonorrhœa; it is, however, a form of treatment eminently suited to the cure of the disease in the female, a condition in which no satisfactory method has yet been evolved.

When any new treatment is introduced in the Army the acid test is a comparison of the average number of days in hospital. At Woolwich the average stay for all cases of gonorrhœa for the year 1928, was forty-seven days: this included a number of old chronic cases transferred from other stations whose stay in hospital was one hundred days and over.

Sufficient of the vaccine is now being prepared in the central venereal laboratory at Woolwich to supply the whole Army, and the treatment is being carried out in India and the Colonies as well as at home by specialist officers who have had previous experience of its use at Woolwich.

APPENDIX "A."

DIAGRAM TO SHOW THE GROWTH OF THE GONOCOCCUS, THE FORMATION OF ENDOTOXIN AND POLAR BODIES, AND THE DETOXICATION WHICH OCCURS DURING CULTURE ON SPECIAL MEDIA.



APPENDIX "B."

TABLE SHOWING H-ION CONCENTRATION (pH) OF URINE AND THE RESPONSE OF THE BODY TO INVASION BY THE GONOCOCCUS.

pH 5·2 | 6·0 | 6·2 | 6·4 | 6·6 | 6·8 | 7·0 | 7·2 | 7·4 | 7·6 | 7·8 | 8·0 | 8·2 | 8·4 | 8·6 | 8·8 | 9·0

Normal range of health (6·0 – 6·9)

Range due to the administration of acid or alkali (5·2 – 8·3)

Range due to acid (below 5·2 – 6·6)

Range due to alkali (6·9 – 8·3)

Range due to 960 grs. of Na_2HPO_4 in 24 hours (6·9 – 7·5)

Range due to 480 grs. $NaHCO_3$ in 24 hours (7·7 – 8·3)

No phagocytosis of Gonococcus. Polymorphonuclear leucocytes in pus nearly 100 per cent. Mononuclear leucocytes (clasmocytes—reticulo-endothelial cells) almost nil. Gonococcus as tetrads due to growth at low pH, invade follicles, the contents of which are at low pH, due to H-ions from glucose. Maximum production of gonococcus mucoid envelope which as a capsule protects the tetrads from phagocytosis. Gonococci almost entirely extracellular. Urethral exudate = True pus. Little or no follicular mucin present.	Maximum polymorphonuclear phagocytosis of the gonococcus. Maximum reticulo-endothelial phagocytosis of polymorphs (alone and with intracellular G.C.). Maximum number of reticulo-endothelial cells, including plasmocytes, monocytes, clasmocytes, lymphocytes. Gonococci are all uniform diplococci; no tetrads, figures of eight, ovoids or spheres present. Minimum development of protective gonococcus mucoid envelope (alkali insoluble). All gonococci intracellular. Maximum secretion of true follicular mucin. Exudate = Muco-pus.	Moderate polymorph and slight mononuclear leucocytosis. Endotoxin production maximum. In exudate, gonococci are present as acidophylic stained. Diplococci of irregular size and spheres, figures of eight, ovoids and tetrads are also present in the order given. At pH 7·6 autolysis is more and more marked in exudate gonococci. At pH 8·4 alkali reserve in the blood is maximum and no ammonia is present. Urethral exudate = Watery muco-pus.

APPENDIX "C."

TABLE SHOWING H-ION CONCENTRATION OF CULTURE MEDIUM AND GONOCOCCAL MORPHOLOGY AND CULTURAL CHARACTERISTICS.

6·5 6·6 6·7 6·8 6·9 7·0 7·1 7·2 7·3 7·4 7·5 7·6 7·8 8·0 8·2 8·4 8·6 pH

← 6·5 – 7·0 →	← 7·1 – 7·3 →	← 7·4 – 8·4 →
The gonococcus forms large, refractile tetrads, figures of eight, sixteen, thirty-two, etc., embedded in a large amount of alkali insoluble gonococcus mucin. Gonococcus tetrads, etc., are deeply basophilic and highly refractile—due to lipoid content. Cultures are raised from the medium owing to division of the organism in three dimensions and no marginal spread of the culture is observed. The culture is milky and opalescent. Discrete colonies are opaque circular, with a central conical nipple, and may reach 4 mm. in diameter. No polar bodies have been observed in the tetrads (they have been seen, however, in meningococcus, Type II tetrads). The tetrads tend to retain Gram's stain, i.e., are Gram-positive to graduated dehydration.	Range of optimum culture Gonococci are uniform diplococci, all of the same size, are Gram-negative and tend to basophilic staining. Are non-refractile (= no lipoid). Autolysis of culture is at a minimum. Minimum amount of gonococcus mucin formed. Culture is transparent with wavy, extending margin due to marginal spread of the culture over the medium in two dimensions. It is moist and viscous with a tendency to be drawn into threads at the higher optimum pH's. Discrete colonies are transparent, dew drop and not exceeding 0·5 to 0·75 mm. in diameter, centre of colouring slightly yellow with transmitted light. Optimum polar-body development takes place.	The gonococcus forms spheres, ovoids, diplococci, figures of eight. Giant forms appear. Staining is acidophilic in proportion to rise of pH and the amount of autolysis. Maximum autolysis is at pH 7·8. Gonococcus mucin only present in small amount. Opacity of cultures due to autolysis of gonococci. Culture is opaque and with rising pH becomes more and more pasty. At pH 8·2—8·4 it is dry, opaque, pultaceous mass, only removed from the medium with difficulty. Colonies may reach 3—4 mm. in diameter. No polar bodies are developed.

APPENDIX "D."

ROUTINE FOR THE PREPARATION OF THE SPECIAL MEDIA AS USED AT THE ROYAL HERBERT HOSPITAL, WOOLWICH.

INTRODUCTION.

The greatest care must be exercised to carry out the whole process of production under the strictest aseptic precautions as sterilization by heat will only result in the destruction of several important properties.

Apparatus.

(1) Test tubes. The most convenient size is 6 inches × ¾ inches. These are boiled in the following solution:

Potassium chromate	50 gm.
Sulphuric acid, commercial	60 c.c.
Tap water	500 ,,

for two hours and then brushed and rinsed in hot water three or four times and left to soak in water for two hours; next dried in a hot air oven, plugged and sterilized at 160° C. for one hour.

(2) Filler. This is sterilized at 120° C. for one hour.

(3) Flasks. Fill with strong solution of potassium permanganate and leave for twenty-four hours, wash with hot water followed by commercial hydrochloric acid. When all stains are removed the flasks are rinsed in hot water to render them acid free, dried in the hot-air oven, plugged and sterilized at 160° C. for one hour.

Media.

There are two types of media employed: (1) Isolation medium. (2) Nucleic acid medium.

The isolation medium is essentially a nutrient serum agar, whilst the nucleic acid medium contains in addition a thymus nucleic acid base. They both contain an alkaline autolysate of ox heart.

A. *Alkaline Autolysate of Ox Heart.*

Obtain the hearts fresh, free them from all trace of fat and fibrous tissue, cut the meat into small cubes and mince in a sterile mincer. Weigh the minced heart and place in a sterile pan. To every gramme of meat add 1 cubic centimetre of distilled water and, in the case of fresh hearts, 40 cubic centimetres of N/1 NaOH to every litre of water added. In the case of frozen hearts 42·5 cubic centimetres of N/1 NaOH.

Leave the whole in the ice chest overnight to macerate. Next morning strain through gauze in 500 cubic centimetre bulks into litre flasks. Steam for quarter of an hour to allow coagulation to take place.

Strain again and steam for fifteen minutes on the first day, five minutes on each of three successive days.

B. *Agar Base.*

Witte's peptone	.. ..	6 per cent
Agar fibre..	.. ..	6 ,,
Sodii chlorid.	.. ..	1 ,,
Sodii phosphat	.. ..	1 ,,
Aqua dist.	.. ..	q.s.

This base is made up in 200 cubic centrimetre bulks in 500 cubic centimetre flasks and is placed in a steamer until the agar is melted, then to each add 0·3 per cent (0·6 grammes) of glucose and steam for a further fifteen minutes.

The base is made up the day before the batch is to be tubed off.

C. *Herring-roe Extract.*

Take ripe sperm of herring, grind it into a paste with distilled water, adding to every gramme of roe 1 cubic centimetre of water. Strain through gauze, steam for half an hour on three successive days.

In an emergency tinned roes may be used (Noel and Sons are the best), but the resulting yield of bodies is not good.

D. *Nucleic Acid Base.*

Desiccated thymus	.. ..	4 gm.
Nucleic acid ..	.. ..	1 ,,
Aqua distillata	.. ..	100 c.c.

Mix in 250 cubic centimetre flask and steam for fifteen minutes. Adjust the pH to 7·2 as follows :—

Add 15 cubic centimetres of 0·02 per cent phenol red solution and 100 cubic centimetres of herring roe extract (C. above) then add N/1 NaOH until the yellow colour turns to brownish yellow, steam for a further ten minutes. *Note.*—If it is heated too much there is apt to be an alteration in the pH and consequent loss of efficiency of the medium.

(1) Ordinary Isolation Medium.

Steam the agar base (made as in B above, but without glucose) until the agar has melted. Steam the heart extract (A above) for five minutes. Mix 200 cubic centimetres of agar base with 200 cubic centimetres of heart extract. Tube off ten cubic centimetres to a tube, add 0·5 cubic centimetre of *human* serum to each tube and slope.

(2) Standard or Nucleic Acid Medium.

Take agar base 200 cubic centimetres and steam until melted. Heart extract fifty cubic centimetres and steam for five minutes, nucleic acid base 200 cubic centimetres and steam for fifteen minutes.

Mix all together, tube off fifteen cubic centimetres to a tube and to each tube add 0·5 cubic centimetre of *human* serum. Slope.

The following brands of ingredients have been found to give the best results:—

Witte's peptone, must be Rostock German brand. Sodium phosphate, British Drug Houses, pure. Nucleic acid, Martindale's. Thymus, desiccated, Willows, Francis, Butler and Thompson.

SOME NOTES ON THE USE OF THE RADIOGRAPH IN PREGNANCY.

By Major J. C. A. DOWSE, M.C.
Royal Army Medical Corps,

AND

Major R. B. MYLES, O.B.E.
Royal Army Medical Corps.

Thirty years ago the doctor had to rely mainly on his sense of touch and his manipulative skill in the treatment of fractures which occurred in his practice.

The advance of the X-ray made diagnosis much more accurate and assisted the surgeon very markedly in his treatment of such cases, by giving him a positive picture of the relative positions of the broken bones.

To-day, even though we have at our disposal a greatly developed science of radiology and excellent X-ray outfits, at any rate in larger centres, capable of taking splendid radiographs, we still rely on our powers of touch and manipulation to decide the "presentation" of the unborn infant or to diagnose pelvic deformities. We have recourse to complicated methods to determine the size of the pelvis, and we submit our patients to invariably unpleasant, sometimes painful, examinations, necessitating when too painful a general anæsthetic, to arrive at our conclusions. Having taken all these precautions we are faced with a possibly unreliable result. Even such an authority as Whiteridge Williams remarks that a series of examinations must be made, even in expert hands, to arrive at an accurate idea of measurements by internal pelvimetry. How often is it not a matter of extreme difficulty, even to the expert, to be absolutely certain of a diagnosis of multiple pregnancy in a stout subject. In short, conditions in any individual may be present which can cause great difficulty at childbirth, and the after-results may be a life of invalidism if the case is not adequately prediagnosed and treated.

With an up-to-date X-ray apparatus and a Potter Bucky diaphragm at our disposal a considerable number of these difficulties are overcome at once, and a very good idea of what the obstetrician has to deal with becomes apparent.

To enumerate a few: The radiograph shows the exact lie of the fœtus in relation to the mother. It demonstrates the position of the presenting part (i.e., under-flexion of the head, occipito-posterior positions, breech presentations, etc., are seen at once). Twins can be beautifully demonstrated from the eighteenth week onwards. There are methods of measuring the pelvis at least as accurate as ordinary pelvimetry.

Pelvic bony deformities are at once demonstrated and, most important

of all, the relative size of the essential fœtal measurements to that of the maternal bony structures can be gauged. In other words, the X-ray in maternity work can render tremendous assistance to the harassed medical man, and it can frequently take the place of the expert obstetrician in deciding points in the multisided cases that occur in the general practitioner's practice.

These notes are not intended to imply that in the employment of the X-ray the obstetrician or the general practitioner has found a panacea for all his troubles, but are merely a plea that more use should be made of the radiograph in antenatal work. During the recent general meetings of the British Medical Association at Cardiff, in the lectures and speeches of many of our leading authorities, merely casual mention was made of the X-ray as an aid in obstetrics and antenatal work.

Since March of 1928 it has been the custom in Poona Military Families Hospital to send to the radiologist for his report every woman registering at the antenatal clinic. All women are asked to come and "book in" as soon as they realize or imagine that they are pregnant. The patients are not submitted to manual examination until later on in their pregnancy; notes of dates, etc., are taken, the radiologist's report added, and the result is an accurate idea of the woman's condition.

By the early booking system a good radiograph of the pelvis is obtained before the increasing size of the uterus and its contents fogs the view. Further examinations are made at the middle and towards the end of pregnancy, and oftener if any abnormal condition makes this advisable. During these later examinations the comparative size of the fœtal head and the maternal pelvic openings can be estimated, and it is at these later visits only that manual examination of the abdomen is made; this is necessary to determine the position, rhythm, rate, etc., of the fœtal heart and to satisfy oneself as to the absence or otherwise of abnormalities not shown by the X-ray, such as hydramnios, etc., and finally to decide the probable date of delivery. In cases shown to be abnormal, i.e., malpresentations, contracted pelvis, etc., more frequent examinations are made, if necessary, so that a definite opinion can be formulated as to the exact method of procedure that should be adopted as full term approaches.

It is obviously foolish to attempt to draw any dogmatic conclusions from a series of cases as small as the series under review, but even in this small number, some fifty-six cases, a number of interesting points have been noted :—

(1) Early radiographs give a good idea of the size, shape and symmetry of the mothers' bony parts.

(2) Embryos are first shown at sixteen weeks on the average of the present series, the earliest being in the twelfth week of amenorrhœa.

(3) Multiple pregnancies may be demonstrated at the above-mentioned period.

(4) Early embryos may be seen in almost any conceivable position, i.e., there being no "normal" position at this stage.

(5) The normal lie from the twenty-fourth week onwards appears to be with the head down, but 10 per cent of our series showed other lies, mostly frank breeches.

(6) The fœtus may change position any number of times right up to the last few days; for instance, breech presentations may become vertex presentations and vice versa. The fœtus may revolve on its vertical axis either during these changes or apart from them. In one case a first breech position changed to a first vertex.

(7) Nature has remarkable powers of remedying, unaided, apparent defects. One case seen first on October 12, 1928, was an obvious brow presentation, on December 20 it was a face presentation and on December 24, *whilst being X-rayed,* it changed its position to an L.O.A., and was delivered as such six days later.

(8) Two cases shown with posterior positions of the occiput were diagnosed and treated as such from the start of labour, which in both cases was prolonged, but eventually gave no trouble. Vaginal examination to determine the exact presentation would have been necessary had not the X-ray given the required information.

(9) The final radiological examination gave positive information of the lie of the fœtus. The fontanelles could be seen and a reasonably accurate picture of the relationship between the presenting part and the pelvic inlet was obtained.

The information is so definite, when properly interpreted, that the use of the X-ray in maternity work appears to be strongly indicated, and further research into the methods of employment, to bring results down to absolute mathematical exactness, will pay by improving our knowledge of the difficult and trying art of obstetrics.

The following was the radiological routine employed by us to obtain as far as possible a standard series of pictures. It will be seen that no attempt was made to make actual measurements of the pelvis. The relative position and size of the fœtus to the pelvis were the chief factors in arriving at the diagnosis.

In apparently normal cases not more than three radiological examinations are made:—

(1) On first reporting, say sixteen weeks: To show the general size shape, and symmetry of the pelvis, to determine the presence of an embryo, and to check as far as possible the estimated duration of the pregnancy to date.

Calcified glands (mesenteric) are fairly frequently seen in this examination, and a calcareous tumour would show up, if present. If necessary this examination is repeated at fortnightly intervals until the presence of an embryo is demonstrated. (A negative picture at say twenty weeks would

be indicative of another cause rather than true pregnancy for the continued amenorrhœa.) As far as our present experience goes, the presence of an embryo is verified about the fourteenth to sixteenth week in most cases, and it need hardly be stated this is the earliest and at the same time the most reliable and definite sign of pregnancy.

(2) At about twenty-eight weeks: To determine the lie of the fœtus, to demonstrate any marked abnormality, and to enable any obvious correction to be attempted. The word attempted is used advisedly; to abhorrence of a vacuum nature would appear to add intolerance of uninvited assistance where no vacuum exists.

(3) At thirty-six to thirty-eight weeks: To confirm the lie and to estimate the approximate relationship between the pelvic bony passage and the fœtal head. If the head is not presenting normally the examination is repeated as required (each case being treated on its merits) until it does so, either naturally or after artificial aid.

Preparation of the Patient.

(1) Steps are taken to have the bowels adequately emptied, not by the use of a metallic purge, which in itself may cast "shadows." A loaded colon may mask an early embryo or alter the position of a fœtus later on.

(2) The subject is warned not to appear for examination wearing silk clothing on the body, or any corset, belt, or other article containing india-rubber, or carrying hooks or buttons. This is important for two reasons. In the first place, the cases are practically all out-patients, and the existence of facilities for disrobing in a military radiological department depends entirely on the ingenuity of the radiologist.

Secondly, the power of pure silk to obstruct the roentgen ray is most striking and should never be forgotten when women are to be examined. The innate feminine desire to appear to the best advantage before the "doctor," though scarcely within the scope of these notes, is universally recognized, and the distress occasioned by the edict that the most alluring garments must be shed and replaced by an entirely shapeless hospital crepe wrapper is quite pathetic.

The matter is made the more striking by the astonishing number of other men's wives who "have nothing *but* silk!"

Technique.

All radiographs are taken with the tube overhead and the patient lying face downward with the abdomen on the Potter-Bucky diaphragm, and the shoulders raised on a fairly high pillow, so that the patient may raise the upper part of the body further to decrease discomfort, especially in the later examinations.

Before an exposure is made the patient is given a little instruction in the art of holding the breath, and rehearsals are carried out with the object of commencing each exposure one full second after the warning, "Take a little breath in—hold it." Some radiologists aver that the words used

should be "Stop breathing," as a patient told to hold her breath gives an involuntary start. The pause of one second, however, allows for this start—which is actually a slight rebound of the chest and abdomen due to the voluntary cessation of their movement, and would occur even if no "word of command" was given—and it must be admitted that "hold it" is a much more satisfactory order when it has to be shouted across a room over the noise of a mechanically-rectified transformer.

At First Examination.

The anterior superior iliac spines are placed one inch above the horizontal centering line of the Potter-Bucky diaphragm, and the radiographs are made on 12 by 10 inch films.

In the first view the central ray is directed vertically on the intersection of the cross-lines of the Potter-Bucky diaphragm at a target distance of 25 inches from the films.

In the second the tube is brought down to 20 inches and moved sufficiently far down the couch to enable the central ray to be directed on the intersection of the cross-lines, with the tubes tilted through an angle of 40°.

By this manœuvre it is hoped that the direction of the central ray will be perpendicular to the bisector of the angle between the plane of the pelvic inlet and that of the pelvic outlet, thereby giving the best possible idea of both inlet and outlet at the same time.

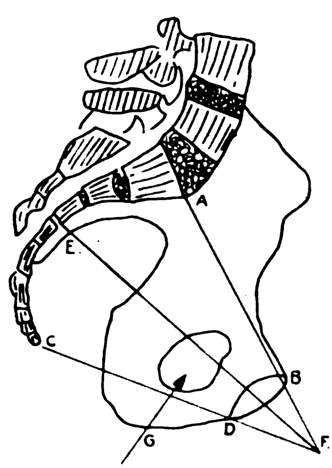


Diagram of sagittal section through pelvis. A B, plane of superior strait or pelvic inlet. C D, plane of inferior strait or antero-posterior plane of pelvic outlet. F E, bisector of angle between A B, C D, produced to F. G, direction of ray.

In these radiographs the embryo is much more likely to be seen in the tilted view than the straight one, as the tilt removes from the paths of the ray the sacrum which, from its configuration and density, is apt to mask a feebly ossified skeleton such as is presented in the early months of pregnancy.

The exposure and tube setting are the same as those used in investigation of a suspected vesical calculus.

Second Examination.

One film, 15 by 12 inches, is usually sufficient with the central ray perpendicular to the couch and the patient in the same position as before. The tube may be slightly harder and the exposure longer for obvious reasons.

Final Examination.

The anterior superior iliac spines are on or slightly below the horizontal line of the Potter Bucky diaphragm for the first radiograph, when a 15 by 12-inch film is used with the central ray directed vertically as before. For the second view a 12 by 10-inch film is used in the same way as in the second view first examination. The tilt used is practically the same, but the tube has to be moved further down the table and raised a little.

The first of these views shows the lie and descent of presenting part, and if a vertex presentation the degree of flexion of the head. The second is the view showing the comparative space available for the fœtus to pass through. The penetration and exposure required are as for transverse view of the lumbar spine.

The shortness of the exposures now employed with an up-to-date apparatus would seem to do away with the fear of damage to the brain-cells of the fœtus, even when two or three examinations are made during the course of pregnancy.

The idea of making use of radiography in maternity and antenatal work is not claimed as original,—there are numerous books on the subject, many giving technique for the actual measurement of the fœtal head and maternal pelvis,—but what we do suggest is that a much fuller use should be made of the facilities afforded by its employment.

In a highly-organized community such as the Army, with its excellent hospitals and well-run antenatal clinics, there is every opportunity of keeping the expectant mother under observation from the commencement of her pregnancy to the birth of her child. There should be no difficulty therefore, at any rate in the larger centres, in taking advantage of the help of the radiologist and in the careful checking of results.

If a method such as the one outlined in these notes could be extended to the larger antenatal clinics throughout the country, as a matter of routine and not merely when an abnormality is suspected, there can be little doubt that a considerable number of the unfortunate accidents of child-birth could be prevented and meddlesome midwifery would become a bogey of the past, to the advantage of the patient, obstetrician and radiologist alike.

We are indebted to Major E. A. P. Brock, R.A.M.C., Officer Commanding, Connaught Military Hospital, Poona, for permission to publish these notes.

Williams. "Obstetrics," Chap. XXXIII, 1920.

A SANITARY SOPORIFIC.

Being the Outlines of a Lecture Delivered to Officers.

"*. . . . General officers will, therefore, arrange for the instruction of all ranks in these subjects by means of four lectures and demonstrations annually, during the winter months, by medical officers . . . .*" (*The King's Regulations for the Army*).

By Major R. A. MANSELL,
Royal Army Medical Corps.

When I was told that I would have to deliver this, and other lectures, to you, I was asked to try to produce something new, something a little different from the usual and now almost stereotyped lecture on sanitation; something that might stir a little interest in more than the dry bones of the subject itself. That, as any of you who have had to lecture will realize, is a severe demand, and I appreciate, before I start, that in breaking away from the established, practically regulated, course and type of these lectures I am undertaking a task which I am ill fitted to attempt. I want to try, however, in a way which I expect will be new to many of you, to show you the real inner significance of these lectures as I see it. True, these may not have been the thoughts in the minds of the men who wrote the Regulations—still—

I have no knowledge of the medical science of the really old civilizations of the world, of the Cretans, of the Assyrians, of the ancient Chinese, and many others. We have the authority of Herodotus that the Egyptians of his day, some four and a half centuries before Christ, and probably of many generations before, suffered under an even more acute development of the specialist system, probably, than we enjoy to-day. "The practice of medicine," he writes, in his second book, "is so divided among them that each physician is a healer of one disease and of no more. The whole country is full of physicians." This much we know of all primitive peoples, both of the past and of the present day, that, like many civilized persons, they must have an explanation *for*, not necessarily *of*, every phenomenon of life and death. Disease, to primitive man, is the omission of a god or the act of a devil, either of whom must be appeased by suitable rite penance or sacrifice.

"I ate my fill of a whale that died
And stranded after a week at sea,
I have a pain in my inside—
Now why have the gods afflicted me?"

I am not going to mention Moses in this rapid survey of one aspect of medical history, both because he was not, as far as I know, a physician, and because, though we have a clear statement of his sanitary precepts—with which you are all acquainted—we have not his reasonings for them as we

have for the tenets and achievements of the men whose work I am going to bring briefly before your attention.

During the latter half of the fifth century before Christ the civilization which centred itself around Athens grew to the age, and flourished in the spirit of inquiry, as any organization is bound to flourish which is not content with such an answer to its doubts and queries as is scarcely better than the question which provoked it. So, as some of you know, the acute mind of the child gains little satisfaction, but enormous stimulus, from those answers to its questions which fall back on the omnipotence of the Deity or the urgency of the occupations of its parents. Out of this spirit, and in it, from his birthplace in the island of Cos, 460 years before the Christian era, arose the physician Hippocrates. His writings remain to us to this day, and his standard of medical ethics is still the highest towards which practitioners of the true art strive. He stands, still, supreme in his day as being, probably, the first who realized—at any rate whose teachings remain for such as me to study—that natural, external conditions could, and did influence, and even cause, disease. He emphasized the great natural recuperative powers of the human body: he saw that the Deity who must be invoked and the devil who must be exorcised resided, very often, in the patient himself; and he based his treatments on simple methods of restoring the diseased body as nearly as possible to its natural healthy state, and then allowing nature to do the rest. He, too, impressed for all time on the medical world the importance of close, scientific observation, not only of disease, but also of health, as a basis from which to judge of these two states. You may find in his writings observations on malarial fevers which have only been re-made within the past few years.

So great was this man that none followed him, of whom we have either record or evidence, who was fit to assume his mantle. Because he was so much ahead of his contemporaries, who could not raise their minds to make the continuance of his science a necessity by their personal or stimulated interest therein, his teachings declined into quackery—practised in his name, but without his skill and without observations of his doctrines—till even the essentials of his gospel became lost in the incantations of charlatans.

Even the veriest terror of a woman may be of infinite value, not perhaps to her husband or her relatives, but, through them, to the world at large. So was Socrates driven from his home by his wife, Xantippe, to teach in the market place and the gymnasium.

To his mother, in the same way, we probably owe much of the spirit of inquiring unrest which produced the greatness of our next physician. Born in the year A.D. 131 at Pergamos, in Asia Minor, of a kindly father and a mother whose outrageous temper appears to have been the potent factor in disturbing him from his home, Claudius Galenus, widely travelled for his day and as deeply cultured by study in this unrestful spirit

of inquiry, resurrected and magnified the teachings of Hippocrates. Celebrated as a court physician of unparalleled efficiency until the jealous exponents of the quackery then rampant allowed him no longer to remain in Rome, his writings place Galen as far above his surroundings as did those of Hippocrates elevate him above his fellows. He, too, was a student, and for his day, no mean one, of cause and effect.

Followed a period when medicine, as a science, passed slowly to the then rising force of the world—Mahomedanism; and among the succeeding practitioners of the art, the outstanding name in medical annals is, perhaps, that of Ebn Sina, or Avicenna, who lived at the end of the tenth and beginning of the eleventh century of our times.

Here again is an enormous gap; but, in part of the civilized world at least, by reason of the advancing knowledge or interest of the general populace, or of parts thereof, and the consequent demand for more scientific and more effective treatment, medicine, though it did not greatly advance, did not entirely slip back.

This Arabian school added little to medical knowledge save in the sphere of pharmacy. To the purists of this school Galen was the law; all else was heresy of the rankest. But no genius appeared to raise the burden of the toiling sick any further from their twisted frames. Men were content that knowledge had been achieved: there could be little more to learn, or there was but sacrilege in attempting it.

In so rapid and, I will admit, biased a pursuit as this of an idea in medical history, I must necessarily omit much that is fact and more that is theory, and to those of you who are even now lying in my track with an ambush of queries, I must plead that I am aware of these omissions, and that the time is due when I should arrive at, or near, the end of this tale.

Let us note, now, that these outstanding men's merits were that they sought for causes, and so far as their powers and understandings went, sought too, for the reasons of those causes. Note further, that a large part of their failure permanently to raise the standard of knowledge in and after their own days, was due to the lack of interest in these new teachings which permeated the general population. The supply was there—potentially; the demand was absent.

Constantinople fell in 1453.

It has been said that the determining factor in the evolution of the British Empire was the building, under the Emperor Shih Hwang Ti about the latter half of the third century before Christ, of the great wall of China. By this, in later years, the hordes of Tartary were turned from the spoils of the East towards the ravaging of the then effete Roman Empire, and so was determined the move of the centres of culture towards the island sanctuary in the West.

No less certain is it that the fall of Constantinople scattered on to a field that was, for some reason, ripe for the sowing, the seeds of a learning

which rediscovered the ancient learnings, and revived not only the text, but also the spirit of the old seekers after the truth. The Renascence of the sixteenth century—note again the gap in the progress of knowledge—re-learned the lessons of Hippocrates, re-taught the doctrines of Galen, and more important still, brought to life again the searching and critical spirit of Socrates. The habit of learning began to become more of a fashion than a fad, and slowly the patronage of the arts was extended to the sciences.

In 1523 the Englishman Linacre gave to the then cultured world a translation of the works of Galen. He found himself between two great schools: the "Arabian" school held staunchly to conservativism, the "Greek" both preached and practised investigation. Paracelsus, at this time in the University of Basle, publicly burned the books of Galen and Avicenna before his first lecture in token that the time had come to advance beyond their entrenchments in the lowlands of knowledge. A few years later, in 1553, Servetus was himself burned at the stake for daring to dispute the written word of Galen.

And so the struggle was continued, stimulated by increasing interest and public demand, till we may take as our next landmark the passage of knowledge still further to the west. Though educated in Padua, it is to the English brain of William Harvey that we owe the discovery, and proof at the beginning of the seventeenth century, of the circulation of the blood.

Antonius von Leeuwenhoek was born in Delft in 1632, and the product of his life was the compound microscope which revealed to Pollender nearly two hundred years later—in 1849—the causative germ of the disease anthrax.

Here, again, note the period of lapse when the possibility of advance existed but the fashion of this particular science declined. Culture and knowledge advanced, it is true, but along other lines. Without the stimulus of popular interest such work as we are considering progresses not steadily but by spurts as individual geniuses happen to be born.

The fight is now carried rapidly into the enemy's country.

In 1796, Edward Jenner, a native practitioner of the village of Berkeley in Gloucestershire, and a pupil of John Hunter, the surgeon, laid the foundation of one of the largest branches of preventive medicine by the introduction of vaccination against smallpox. That he had been forestalled in the actual discovery by Benjamin Jesty, a cattle dealer of Dorsetshire, who in 1774 vaccinated his wife and children, and protected them against the disease, is an academic point which is of particular interest to us here in that it shows that at this time the demand for improved knowledge and increased attainments existed strongly even amongst the common folk, and was, we may take it, the stimulus to that extraordinary advance which commenced early in the nineteenth century and is continuing to-day. Names crowd on top of one another, Pasteur, Lister, Koch, Manson, and innumerable followers too recently dead or too lately born for me to attempt to single out the few for mention, even had I the time.

The whole of these works, from the days of Hippocrates onwards, have been governed by the belief, so strong in the mind of the worker as to be a creed, worthy even of martyrdom—that man and his relationship to his environment are ordered by natural rules and not by demons; that to say that diseases and disabilities are the punishments of a god unreasonably divorced from man, not only amounts to a frank confession of ignorance that does not desire to be enlightened, but is also no great credit to the god so accused; that god is rational and his works regulated, not the being of passionate impulse which is generated in the minds of primitive peoples. An effect must have a cause, a cause must have a reason; if we can find the reason, can we not so modify the cause as to remove its noxious effect?

I have put before you, hurriedly and very crudely, a survey of medical history to try to emphasize that science is not sufficient to itself; it depends very largely for its stimulus to advance on the intelligent demand for that advance from the people whom it is trying, however indirectly, to benefit. Where the demand is absent, or is not truly intelligent, the weeds of quackery grow rapidly in from the edges and dam back the stream.

I want you to remember that, as knowledge sank, after Hippocrates, after Galen, back into the mud of blinding witchcraft and maiming charlatanism, and at other times halted in its progress because the stimulus to continue was not there, so, too, may it happen in our day again, if ignorance and indifference surround our steps. Realizing this, we ask that you should give us your interest, your further demands, and in these lectures we try to show you how far we have got towards helping you, how far you can help us, and for our own well-being, we strive to create from you the stimulus which will prevent our hard-won knowledge from sinking again into the limbo of forgotten things.

PUBLIC HEALTH STATISTICS.

By F. S. HILL,
Late Staff-Serjeant, Royal Army Medical Corps.

From time to time certain Government Departments and Medical Officers of County Councils, Borough Councils and other local authorities publish reports relating to the public health which contain considerable information concerning the work of the various sections of the Health Service, and in addition to indicating the progress in sanitation, hygiene, etc., that has been achieved, and stressing the need for further endeavour in special directions, these reports contain statistical tables which often do not receive the careful study which they deserve. Figures are often voted "dull" and "uninteresting," and are passed over, whereas to those who take the trouble to study them they are as illuminating as paragraphs of written matter. Care is needed, of course, properly to appreciate their value since unless they are considered in relation to all the known facts they may, unintentionally, be misleading; but the various "rates" and "percentages" to be found, for example, in the annual report of a borough medical officer of health, are worthy of consideration by all citizens. A slight knowledge of what these figures stand for will make them as interesting to the "man in the street" as they are already to the statistician. No abstruse mathematical calculations are usually employed, nor will the reader's memory of unhappy wrestlings with knotty problems in school days be aroused by the remembrance of logarithms and discussions on the degrees of error and accuracy.

There are in such reports, which are usually framed according to definite instructions issued by the Ministry of Health, certain relatively elementary statistics which shed some degree of light upon the state of the public health, and are therefore worthy of consideration. A knowledge of the methods of compilation will serve to make them of even greater interest. In the succeeding paragraphs the cardinal matters in such reports are briefly dealt with, and it will be realized that the study of these statistics when they extend over a considerable number of years is well worth while.

In passing, a brief word may be said concerning statistics. Statistics may be described as the science of counting, or the science of numbers. Statistics are of most value when employed in connexion with large numbers that are not easy of comprehension, and they are necessary for comparative purposes. They involve the collection of certain material, its tabulation, summary and calculation. In some matters, in addition to the statistical report, illustrations by means of the graphic method are useful. These may be based on the natural scale, or, better still, on a logarithmic

scale which indicates ratios rather than quantities and proportional variations.

Population.—This is ascertained correctly at each census, but at subsequent or intercensal years is estimated by various methods. These include the following: (1) The natural increase of births over deaths. (2) Ascertaining the average number of inhabitants per house at the last census, and making a calculation based on the number of inhabited houses. (3) Assuming that the birth-rate remains constant. The number of registered births being known, the population can be calculated on the basis of the birth-rate known to have held good in the last census. (4) The employment of logarithms, this being perhaps the most reliable of all methods. It is the Registrar-General's method, and assumes that the same rate of increase will hold good as in the previous intercensal period, that is that the population increases in geometrical progression. The problem is therefore one of compound interest. The importance of obtaining as correct an estimate of the population as possible is very great, since nearly all rates are based upon it; an under-estimated population gives, for example, an unduly high death-rate and birth-rate, or vice versa. Rapidly growing districts to which young married couples move obviously affect the calculation of the population of the whole area concerned.

Marriage-rate.—This is usually expressed as the number of persons married per 1,000 of the population (not the number of marriages). In this figure re-marriages of widows and widowers are included; it would be more accurate if the calculation of the marriage-rate were based on the number of bachelors, spinsters, widowers, widows and divorced persons living at marriageable ages.

Death-rate.—The crude death-rate or general death-rate is calculated upon the basis of the population and all the deaths that occur in the district. Obviously this is not fair to the district if it contains many institutions and hospitals, and, therefore, it is usual to exclude the deaths of non-residents in the area and to add the deaths of residents that occur outside the district. The rate then ascertained is the recorded death-rate.

A more accurate rate is the standard death-rate. The standard death-rate of a country is the average death-rate at all ages experienced during the previous intercensal decade. It is, therefore, based upon the data of a decennium, and not, like the preceding rates, on annual or monthly information. The standard death-rate of any part of a country is the death-rate at all ages which would have occurred in it if each of the twelve age-groups of its population had experienced the same death-rate as occurred in the corresponding twelve age-groups in England and Wales during the previous intercensal decade. Therefore, the standard death-rate of a portion of the country or a town will be the same as that of England and Wales if its population is distributed as to age and sex in the same proportion as that of England and Wales and if the mortality corresponds.

This naturally brings one to the corrected death-rate, which is the death-rate corrected as regards age- and sex-distribution of the population. Obviously this is the fairest calculation on which death-rates of various localities can be compared. The corrected death-rate, therefore, is the recorded death-rate multiplied by the "factor for correction" for sex and age distribution, and this is obtained by dividing the standard death-rate for the whole country by the standard death-rate of the locality concerned, the quotient or result being the factor for correction. Unless such a factor be employed it is necessary to remember when considering the death-rates of a district that an increase does not necessarily mean a less healthy standard of life. A decrease in the birth-rate over a long period has the effect of raising the age-status of the whole population. During the early years the decrease in infants and children at susceptible ages of life helps to keep down the death-rate, but later the result of a continued low birth-rate is to produce a greater proportion of older people in the community when the liability of such to death begins adversely to operate.

Comparative Mortality.—A useful method by which death-rates of different towns may be compared is by means of the comparative mortality figure. The recorded death-rate at all ages for England and Wales is taken as 1,000, and the corrected death-rate of each town is then compared with that figure. The alternative method of comparison is complicated, and involves the expenditure of much time; it consists of comparing the number of deaths in age- and sex-groups in proportion to the population at each age- and sex-group.

Death-rates for Diseases, Occupations, Etc.—Special death-rates are often usefully calculated for particular diseases, occupations, and for each sex. When death-rates are calculated for certain periods, such as for quarterly or monthly returns, it must be remembered that a quarter or one-twelfth of the total annual population forms the basis of the calculation.

The Registrar-General obtains the quarterly population by multiplying by thirteen the population of one week, which is obtained by dividing the estimated population of a town by 52·17747.

Infantile Mortality.—Whereas marriage-, birth- and death-rates are based on populations which, in intercensal years, are ascertained by careful estimations and are, therefore, dependant for their correctness on the accuracy of that estimate, the infantile mortality rate is expressed as a certain number of deaths of children under one year of age per 1,000 births in the same year. This rate is not, of course, a strictly accurate statement but it is near enough for all practical purposes. It is a sensitive index to the health and general sanitary condition of a district, but if any area is to be judged effectively by this standard, a series of such statistics extending over a few consecutive years should be studied. Infantile mortality is most heavy in the first three months of life and especially during the first four weeks—the dangerous neo-natal period. It is highest among male children and thus equalizes the higher proportion of male children that are born.

If ever the law relating to the registration of births is revised so that the ages of the parents are recorded when the births are registered and if it is then ascertained whether the child is a first or later infant, further valuable information will be made available for the statistician. Illegitimate children are less likely to survive than legitimate children, and separate infantile mortality rates should be calculated, the deaths of legitimate infants per 1,000 births of legitimate children, and the deaths of illegitimate infants per 1,000 births of illegitimate children. Male children have a greater mortality *in the earlier months of life*, hence a reduction in infant mortality raises the male proportion of children. After the first year of life the excess of female resistance to death over that of males, is small, gradually disappearing as age advances until at 10-15 years a higher death-rate for females is the rule. If infant deaths are considered in two groups, (1) those which are inevitable owing to the children being born without capacity for survival even under ideal conditions, and (2) those which are avoidable, death resulting from the effect of unfavourable environment, it is clear that as infant mortality falls generally the share of class (1) of what remains must increase. There will always be a point, not yet ascertained, beyond which it is impossible to reduce infantile mortality. The fact that recent improvements in environment have been accompanied by less fall in the mortality of males than of females, suggests that a larger proportion of the deaths of males belongs to class (1). If this be so then further improvement may be expected to result in further increase of the difference between the sexes. The greater excess of deaths of males over females in the earlier months of infancy points in the same direction, for the proportion of inevitable deaths must fall off rapidly as life advances. The value of statistics as an aid to scientific work for the health of the community is clearly demonstrated in such a subject as the study of infantile mortality, in which they point out those aspects of the question in which progress is made or where the need for further efforts is most obvious.

When preparing statistics relating to infantile mortality it is necessary to remember the injurious effects of overcrowding which implies some measure of poverty; since bad housing, insufficient clothing and food, strike most effectively the weakest members of the community. It is useful to prepare rates for the *density of the population per acre and for special areas* where the infantile mortality is under review. Overcrowding may also be demonstrated with definite accuracy by means of a special census, taken by the health visitor or sanitary inspector, of certain streets in which the number of inhabited rooms per house is recorded. The number of persons per room and any overcrowding may then be ascertained: it being usually accepted that where more than two persons are found per room overcrowding exists, or at all events undesirable crowding involving the improper mixing of the sexes. Another good index of the state of the housing of the people and its influence on infantile mortality may be ascertained from information supplied by the

health visitors who visit newly-born infants where the birth occurred at home. The following will be found to be a useful statistical table by which to demonstrate the conditions existing :—

Number of persons in family	Number of families occupying the following number of rooms			
	1 room	2 rooms	3 rooms	4 rooms and so on
1				
2				
3				
4				
5				
6				
And so on ..				

It should be definitely stated in a footnote to such a table that the newly-born baby has *not* been included in the figures, nor day occupants (such as the midwife) in the room, but only the actual number of residents who sleep there. It is usual to include kitchens, but not sculleries, bath rooms, etc.

Infectious Disease.—The incidence of infectious disease is subject to the laws of periodicity, and it is useful to employ the method of graphic charts upon which each disease is recorded in weeks. For the study of certain diseases it is desirable also to record the temperature and other climatic conditions. The fact that some diseases, such as measles, move in cyclical waves and "salt" the susceptible population must also be remembered.

Ward Statistics.—It is a good thing in all large urban districts for statistics to be prepared for each ward on a uniform basis in order that they may be compared. Tables afford a good index of the condition of the wards if they include statistics relating to births and birth-rates, deaths and death-rates, infantile mortality, deaths from pulmonary tuberculosis, and from all forms of tuberculosis, attack-rates and death-rates from all the principal epidemic diseases; density of persons per acre, percentage of open spaces to total ward area, and total population.

Life Tables.—No reference to vital statistics is complete without a reference to Life Tables. These indicate the probability of life at any age; they may be prepared nationally, locally, or for occupations, etc. A good deal of labour is involved in the construction of a life table, and where none is available it may be found useful to remember a simple formula to find the expectation of life at any age between 25 and 75. It is as follows: Take 80 years as basis, deduct present age, and two-thirds of the remainder represents the expectation of life. This only operates up to 75 years with any measure of accuracy; and in view of the increasing probability of length of life, the result of the application of this formula is not an over-estimate but rather an under-estimate of the expectation of life.

Editorial.

THE CARBOHYDRATE CONTENT OF FOODS.

BEFORE and during the Great War, it was customary, when determining the value of a particular food, to estimate accurately the protein and fat, and to arrive at the carbohydrate by subtracting the water, protein, fat and ash-content from the total weight of the substance analysed. Very few estimations were made of the amount of carbohydrate in a *cooked* food, and very few attempts were made to distinguish between the *available* carbohydrate which can be utilized by the body and *unavailable* carbohydrate. The estimation of carbohydrates by difference or by copper reduction after hydrolysis with weak acids includes hemi-celluloses and other bodies which seem unavailable.

Professor R. H. A. Plimmer, in his book on "Analyses and Energy Values of Foods," prepared for the use of the War Office, points out that the carbohydrate present in animal tissues is negligible. The amount of glycogen is given fairly accurately by difference; only lactose in milk is estimated separately. The carbohydrates in vegetable foodstuffs are most commonly glucose, fructose, cane-sugar, maltose and starch. The sugars are determined by chemical means and the starch by difference. In the analyses of vegetables the edible portion was separated from the waste and both were carefully analysed, the carbohydrate being determined by difference. In the case of the vegetables in common use, such as potatoes, peas, beans and marrows, analyses of the cooked vegetable were made as well as of the raw vegetable.

Professor Plimmer's analyses were of great service to the War Office authorities during the war, as they were the only ones which gave a definite idea of the value of English foods. Before his results were obtained foreign tables, especially those of Atwater and Bryant, had to be used when constructing diet tables.

The carbohydrate present in a vegetable food may exist in many forms, from the simplest monosaccharide to the most complex polysaccharide. It may be divided into three fractions: (1) The readily available carbohydrates, such as glucose, fructose and sucrose; (2) possibly available material, the hemi-celluloses, yielding sugar on acid hydrolysis; (3) the unavailable residue, mainly composed of cellulose.

In time of need, when starchy grain foods were scarce, the members of the second fraction, hemi-celluloses, have always attracted attention as a possible source of food for both man and animals. During the German food shortage in 1916-18, Rubner and other scientists made many experiments on cell-membranes as a source of food, to which reference will be made later.

The modern dietetic control of diabetes emphasized the defects in our present knowledge of carbohydrates, and the discovery of insulin increased the need for accurate estimation of the carbohydrate actually given in food.

Dr. R. A. McCance and Dr. R. D. Laurence have just issued a Report, presented by the Medical Research Council, on the carbohydrate content of plant foods, and the food value of vegetable carbohydrates, in which they say that while the analyses by chemists of the protein and fat in foods are fairly uniform and satisfactory, analyses of the carbohydrate content might vary by several hundred per cent.

Apart from the discrepancies in the figures given for the same food by different chemists, they comment on the fact that very few analyses of *cooked* foods are available, and little or no attempt has been made to distinguish between *available* and *unavailable* carbohydrate. These defects in our knowledge Drs. McCance and Laurence have endeavoured to rectify, and all the cooked foods were analysed after ordinary domestic cooking, without the addition of sauces, etc. They have also carried out biological assays of various carbohydrates on diabetics, in which the effect on the blood-sugar of different amounts of carbohydrates has been compared with a standard amount of bread. These experiments strongly supported the values which they obtained by chemical analyses. They found that foodstuffs rich in starch or sugar, such as potatoes or apples, gave results which agree with the older analyses, whereas the green vegetables have differed in yielding lower figures. These low results explain the great vogue of green vegetables in the treatment of diabetics and the almost specific value attributed to them.

Drs. McCance and Laurence give tables of analyses for fruits, nuts and vegetables. There are six analyses of each article, and the total reducing sugars (pentose shown separately), non-fermentable sugar (chiefly pentoses), and available carbohydrate are given. The available carbohydrate is the important figure from the point of view of practical dietetics, and the figure is printed in heavy type.

The average percentage deviation of the six separate estimations was 17 per cent for fruits, 18 per cent for vegetables, and 9·5 per cent for nuts. These deviations depend on variations in the plants themselves, and on cooking and serving, and are considered to represent deviations in these foods from day to day as they are actually eaten.

Drs. McCance and Laurence made estimations of white bread from the hospital (King's College) kitchen, but as the figures agreed with previous analyses they are not given in the tables.

Dealing with the food values of vegetable carbohydrates, they classify the carbohydrates which are usually estimated by difference into: (*a*) Starch, and the soluble sugars, sucrose, glucose and fructose; (*b*) the hemi-celluloses; and (*c*) fibre. Group (*a*) includes all the carbohydrates which can be removed from a plant by warm water and the enzyme diastase. Group (*b*) includes

the hemi-celluloses, viz., those polysaccharides *not* removable by water and diastase, but hydrolysed by 1 to 3 per cent boiling mineral acids. Group (*c*) includes the fibre, sometimes spoken of as cellulose, viz., all the bodies of a more or less carbohydrate nature which resist the action of dilute acids and alkalies and require special reagents to hydrolyse or bring them into solution.

Starch and soluble sugars are the carbohydrates of prime importance in the nutrition of man and animals, and are almost entirely digested, absorbed and utilized. They are not further discussed.

Fibre consists in the main of true cellulose, but also contains a little lignin and pentosans. The lignin is not digested at all by man or animals. Herbivora, especially the ruminants, and some carnivora, dogs and pigs, digest cellulose fairly well. Rubner's results show that man also is able to digest cellulose. Some 80 per cent of the cellulose in fruit and vegetables disappears and some 40 per cent of that in bread of various millings.

The older observers accepted without question that the digestion of cellulose was the result of the action of enzymes secreted by the digestive juices. But the observation that cellulose was digested by some animals which did not secrete an enzyme led to further experiments, and it is now believed that there are three methods by which cellulose is digested in the gut : (1) By a specific enzyme of animal origin—only occurs in invertebrates; (2) by a specific enzyme of plant origin—autolysis—probably of little moment in man. Both (1) and (2) lead to the formation of sugars. (3) By bacteria. This symbiosis is the most important mechanism; the ultimate products are fatty acids, chiefly butyric and acetic.

In man the only important mechanism is bacterial fermentation which probably gives rise to fatty acids. Cellulose foods are very bulky, and to make their digestion an important source of energy, the alimentary canal must be large in proportion to the size of the animal and digestion must be slow. Man therefore is not fit for a cellulose diet. According to Schmidt, the average amount of pure cellulose eaten by man is only 0·5 to 1·5 gms.

Diabetics in King's College Hospital on high vegetable diets were found to be eating 4 gms. of cellulose a day, exclusive of bran biscuits; if these were included the total amount might be 12 gms. Normal people on normal diets would rarely absorb 6 gms., and as 25 per cent. of this energy value is lost during fermentation, only 4·5 gms. can be metabolized, and this would work out at 0·3 calories per kilo. per day, a negligible amount. The energy derived from the digestion of cellulose, even in diabetics, must be very small and of little moment in the calculation of the total calories required.

Under the generic title of hemi-celluloses are grouped all substances of a carbohydrate nature in plants except fibre, starch and soluble sugars. Hemi-celluloses are all hydrolysed into their constituent members by dilute mineral acids, which fact separates them from the fibre group. They are sharply separated from the starches by the fact that none of them is attacked by the digestive enzymes of the mammalian gut. Some

are true carbohydrates like the pentosans, which are made up of 5-carbon sugars instead of 6 carbons, as in starch. The two pentose sugars are xylose and arabinose. The pentosans are almost wholly associated with the insoluble framework of plant tissues. In spinach Rubner found 16·4 per cent of the total solid matter in the press juice, but only 4·6 per cent of the total pentosans; in the case of apples his figures were 52·6 per cent and 10·7 per cent respectively.

The free sugars xylose and arabinose are absorbed from the small intestine, though more slowly than glucose. Having passed the intestinal epithelium with its powers of selective absorption, all sugars seem to penetrate the tissue cells with equal rapidity, xylose and arabinose as readily as glucose.

Pentoses might have been used extensively for diabetic feeding had they not, by acting as an alternative source of energy, allowed an equivalent amount of glucose to become available for storage, luxus consumption or excretion, according to the condition of the subject.

Pentosans are absorbed from the intestine mainly by the action of bacteria, and the products of this action are lactic acid, formic acid, ethyl alcohol, methane and hydrogen. Individual pentosans may be very completely digested, to an extent unknown with cellulose. This is mainly due to their solubility in water.

Man derives quite insignificant amounts of energy from pentosans because his food contains so little of them. They occur with cellulose in fruits, vegetables and bread, especially wholemeal bread.

Cellulose and cell-membranes are supposed to add bulk to the fæces by virtue of their indigestibility, and to counteract constipation by stimulating the wall of the gut to contract. As a matter of fact cell-membranes can only increase the fæces by about 2 per cent, not nearly enough to affect the bulk. The increase in bulk is mainly the result of glandular activity, and this is not merely the result of irritation caused by the insoluble material in cell-membranes. Fruits and vegetables which are relatively well digested cause a large increase of detritus, etc., in fæces. It would seem that some chemical extract, or product of decomposition, were the chief stimulant.

It is therefore mainly by gland stimulation that cell-membranes exert a laxative action.

In times of need men and animals have always turned to the carbohydrates of the cell-membranes as possible sources of food. Lichens and tree-bark have been eaten in polar regions when no other food was available, and seaweeds, which contain large amounts of pentosans, have been eaten both raw and cooked.

Under conditions of modern warfare the problem is twofold: (1) Can man derive appreciable amounts of energy from such things as wood and straw? (2) Can these cell-membranes be so altered before feeding that they become digestible?

The Germans investigated these points carefully during the food shortage, 1916-18. They tried finely-ground chaff, straw and even wood-meals, which were intended to be mixed with wheat and rye flour to be used for baking. Rubner's experiments showed chaff, straw and wood-meals were only partially absorbed, and caused very undesirable scouring of the intestine. Further experiments were then made to see if these substances could be made more digestible before being eaten. Two chemical methods were tried. The first, introduced by Lehmann, consisted simply in heating the straw, &c., with strong alkali, which was then removed. This process removed most of the lignin and other incrusta, leaving the carbohydrates of the cell-membrane behind, and it was proposed to add a proportion of the residue to bread. Rubner found that as an addition to bread it had no advantage, being largely excreted unchanged, and actually causing more nitrogen to be excreted.

The second method introduced during the war never found favour. It consisted in treating wood or straw with HCl gas or H_2SO_4, and was never justified experimentally.

In the light of their researches, Drs. McCance and Laurence discuss the value of wholemeal bread. They point out that Liebig advocated wholemeal bread during the famine in East Prussia. He believed it to be very well digested and more satisfying than white bread, and attributed its efficiency partly to the inorganic salts in the outer layer of the grain. These salts are largely phosphates and are the basis of many popular advertisements at the present day. Rubner, however, showed that the proteins of the bran were digested with great difficulty and only very partially utilized. Plagg and Libbin made a detailed investigation for the German military authorities in 1897, and came to the conclusion that the issue of wholemeal bread to troops was uneconomical.

The discovery of vitamin B in the part of the grain lost by milling gave a fresh impetus to the wholemeal agitation. The chief supply of this vitamin lies in the embryo, and the argument in favour of wholemeal can only apply to wheat, for in milling rye the embryo separates with the meal and not as in wheat with the bran. The vitamin-content of wholemeal bread is not denied, but Drs. McCance and Laurence state that it remains to be proved, as has been suggested, that the chronic indigestion and constipation of civilized populations has its origin in a vitamin-B deficiency. In advocating wholemeal bread, especially for the poorer classes, it must not be forgotten that Mellanby's work shows that some constituent of oatmeal and wheat embryo has a deleterious effect on bone calcification and predisposes to rickets.

White flour is a better source of energy than wholemeal flour. White bread contains a higher percentage of starch than brown bread, in which some of the starch is replaced by cell-membranes, soluble pentosans and proteins derived from bran. The cell-membranes are indigestible and enclose the proteins and make them indigestible too, so that 30 to 40

per cent pass out unchanged in the fæces. It is clear that a flour containing these cell-membranes, pentosans and indigestible proteins cannot be of equal calorific value to one which has had them removed. Rubner found that on a diet of white bread, or average mixed diet, the percentage of the total food calories lost in the fæces amounted to eight, while on a wholemeal diet the figure rose to fourteen. Whether in times of need it is a national economy to use wholemeal bread instead of white is a difficult question to answer, as it depends on so many factors. The most important of these are : Can the bran milled off be used for animal nutrition? Can sufficient nutriment be obtained from the parts milled off as bran to compensate for the increased loss of calories in the fæces due to their irritating properties? The answers to these questions depend on the coarseness and the amount of bran left with the meal, and on the age of the persons eating the bread. It must be remembered that not only men but also women and children are concerned, and children are very intolerant of high cellulose diets. Most of the experiments have been carried out on adult males or animals, and caution must be exercised in recommending wholemeal bread generally. Before accurate conclusions can be drawn, careful unbiassed experiments should be made on a sufficient number of men, women and children.

Clinical and other Notes.

PEMPHIGUS VEGETANS.

By Major D. H. MURRAY,
Royal Army Medical Corps.

In view of the rarity of the condition, the following report of a case appears to be warranted.

This skin disease, pemphigus vegetans, is a *very* rare affection. McLeod [3] gives a list of references in the literature and quotes thirteen writers. He states that only about 75 cases have been recorded. Sequeira [5] mentions two further references, and remarks that only one case has been seen in the London Hospital for many years.

Ætiology.—Nothing definite is known upon this point. Some observers suggest it is a true pemphigus with a superadded infection, as vegetations may occur in other cutaneous lesions, and then they are probably caused by staphylococci. In some cases diagnosed chronic pemphigus, streptococci, *Bacillus pyocyaneus* and diplococci have been found both in the bullæ and in the blood.

Eberson [2] in 1923 claimed to have found an organism in a series of seven cases of acute pemphigus; it was a Gram-positive, anaerobic, non-motile coccoid form, resembling a streptobacillus in certain respects.

Schalek [6] reports a case in which cultures (on brain glucose broth) from the blood, and from a bulla, showed a bacillus identical with that described by Eberson.

Sabrazes and Torlais [4] discuss in every detail the ætiology of the group pemphigus, and conclude that the sub-groups, vulgaris, foliaceus, and vegetans are all varieties of the same disease.

They give exact observations on seven cases of their own, and regard pemphigus as essentially a microbic infection.

In our case a streptococcus was isolated from lesions on the finger, fore-arm, and in the axilla. An autogenous vaccine was made and administered with no effect. Blood-culture was sterile.

Some writers have pointed out that the onset of this condition may be preceded by some definite septic focus, as is the case in acute pemphigus. In this case there is a history of a lesion of the finger.

Age.—The affection is found chiefly in adults, but it has been known to occur in children; it would appear to be more common in females than in males.

Nationality.—No particular reference is made to race.

Course and Prognosis.—The prognosis is invariably grave, and in cases where recovery has been reported it has usually been temporary and in

the nature of a prolonged intermission, followed, after a varying time, by a recrudescence and a fatal issue.

A case of unusual chronicity in a female, which was under observation for some years, is reported by Barker and Carter [1]. There the lesions were in the mouth and later on the vulva; then a further extension of ulceration to the pharynx, palate, and lips took place.

Cases occur where the eruption runs a benign course, and then it is limited to the limbs and trunk. Sequeira [5] quotes such a case.

Case now Reported.

The following are the details of this fresh case:—

Age, 26; sex, male; nationality, Jew; trade, upholsterer.

Family History.—No details were obtained of other cases of any skin disease in his family.

The previous immediate history is as follows:—

From September 22, 1928, the patient was under treatment for eleven days for a condition of indolent septic lesions on the index and third finger of the left hand; these were treated by picric acid dressings, and they healed up.

But on November 11, 1928, these lesions recurred again and, in addition, a small area near the umbilicus was reported. Treatment with picric acid dressings for twelve days caused them to heal.

On January 22, 1929, he reported once more, this time with what were described as large patches of crusty eruption in the axillæ. Various local applications were tried, namely, resorcin, tincture of iodine, mercury perchloride, silver nitrate and acid. salicylic., but these had no effect.

Intramuscular injections of collosal manganese were also administered. It was noted on February 4 that the eruption was becoming generalized. Further measures were adopted, such as potassium iodide internally, stabilarsan intravenously, and daily immersion in sodium hyposulphite baths.

The condition continued to extend, and on February 17 the mouth and fauces and uvula were reported to be œdematous and a suspicion of a membrane noted; throat swab examinations and culture findings were negative for *Bacillus diphtheriæ.* The temperature was noted for the first time to be above normal, being 100° F., and the pulse 100.

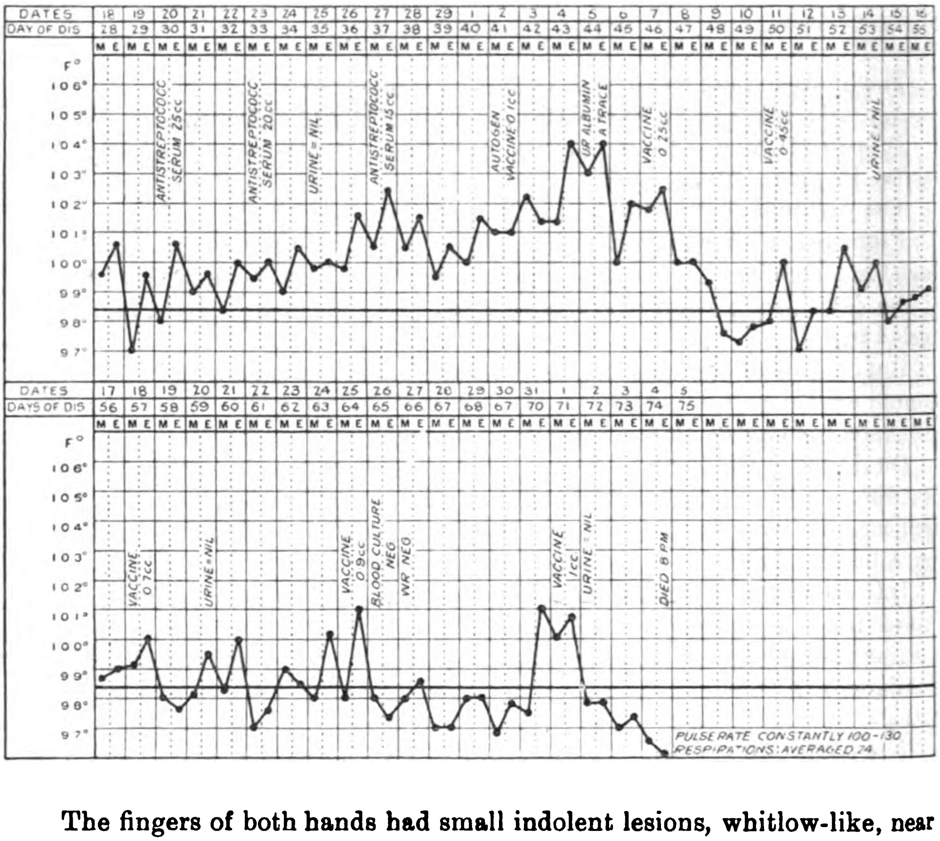
On February 18, 1929, the patient came into our ward, and we saw him for the first time on that date; the condition then—that is to say, twenty-eight or more days from the onset—was, in detail, as given below:—

One noted immediately a musty, fœtid, penetrating odour.

The scalp had numerous impetiginous lesions. The face, in the region of the beard, had many crusted lesions impetiginous in type, but moist. The mouth showed two or three denuded areas on the cheeks and gums, while the fauces were œdematous and injected.

The body had the following lesions: There were a few raw areas or flaccid bullæ on each shoulder, with four or five at the waist-line; these varied in size from one to three inches in diameter; they were not on an inflammatory base. There were a few small scattered lesions on the buttocks, extending on to the thighs, and similar areas on the chest, and on the abdomen round the umbilicus; these all were impetiginous in type.

The arms had a few similar small impetiginous lesions scattered both on the fore-arms and the upper arms.



The fingers of both hands had small indolent lesions, whitlow-like, near the nails, or interdigital in position.

The axillæ were covered by flat, sodden, greyish condylomatous-like vegetations which extended on to opposing surfaces for about eight inches by four inches in area. There was a moist, semi-purulent exudation in their multiple interstices and they tended to bleed readily. At the margin of these areas small fresh or flaccid ruptured bullæ were apparent; the skin margins peeled back when the surface was cleaned, even gently, and raw, oozing, tender patches were exposed.

The further history of this case is the record of a gradual but relentless extension of this process of denudation. This made its way down the inner

aspects of the upper arms, and from the elbow flexures down to the forearms. It extended across the abdomen and down towards the pubis. From the groins it spread round the perineum into the sacrum and buttocks. From the waist-line at the back, it moved up and down until the whole of the back was raw, and the dressings, on removal, here as elsewhere, exposed an oozing, bleeding surface.

The vegetations appeared in sequence on the following parts: axillæ, groins, face, perineum, and abdomen; they were flat in character, except in the axillæ and on the face. The scalp, neck, thorax, back, and limbs remained clear of these vegetations. Ultimately they disappeared completely from the face and dried up very considerably on the other areas.

Among the more distressing conditions were the denudation of the mouth and lips and the involvement of the eyelids.

In spite of these complications the patient took all nourishment well, in fact, showed remarkably little loss of appetite, and slept regularly. His mental outlook was, on the whole, hopeful throughout.

Although the local conditions improved to the extent that septic areas became perfectly clean, vegetations shrunk, and the odour disappeared; and although the temperature subsided and food was well taken, the patient became progressively more wasted, weaker, and drowsier, and died on April 4, 1929, that is, seventy-three days after the onset of the body invasion.

The treatment adopted was, internally, alkalies, arsenic and strychnine, calcium lactate and ichthyol. Locally, mercury preparations, aniline dyes (acriflavine and gentian violet). Eusol dressings were found to be too irritant. Calamine cream and calamine lotion were also tried. In the end, the best dressing was acriflavine gauze, with No. 7 paraffin spray; with this the local condition was as perfectly clean as one could desire. Anti-streptococcal serum was administered to begin with.

An autogenous vaccine was given weekly.

The temperature chart for the period is shown on p. 286. A notable point was the constantly high pulse-rate throughout the disease.

I am indebted to Lieut.-Colonel T. S. Coates, O.B.E., R.A.M.C., Commanding The Citadel Military Hospital, Cairo, for permission to publish this case.

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A MILD FORM OF TROPICAL SORE.

By Major D. REYNOLDS, M.C.
Royal Army Medical Corps.

During the autumn and winter each year there has occurred in Ismailia, Moascar and Abu Sueir, a type of indolent sore which closely resembles a mild form of cutaneous leishmaniasis.

No specific organism has, however, been found microscopically either at Moascar or Abu Sueir.

The appearance of the ulceration is very similar to that described in the Memoranda on "Medical Diseases in Tropical and Sub-tropical Areas," under "oriental sore," with the exception that the edge is not raised, nor reddened to any marked degree.

Both the ulcerative and non-ulcerative forms occur, but in the latter, the skin is of a definite purplish colour. One attack does not confer immunity, and the final scab presents an unusual appearance in that it has a wart-like projection in the centre. This projection is the last part of the scab to disappear, and in some cases remains for a considerable period.

After trying various methods of treatment, not including injections of antimony tartrate, I found the application of an ointment of antimony tartrate, followed by lotio rubra, most effective. Indeed, I have had no case of failure up to the present, when the treatment was carried out as described below.

The ointment consists of two per cent. antimony tartrate in vaseline or lanoline, and is used as follows:—

Hot boric fomentations are applied for twelve hours, and the ointment applied on lint in the morning. The ointment is reapplied morning and evening, four times in all, and by the end of this time, a sharp local reaction should have occurred. If this has not taken place, the treatment should be recommenced, increasing the strength of the ointment of the antimony tartrate to 2½ per cent.

In no case have I found that the application for forty-eight hours has caused any harmful effects.

After the last application of the ointment, boracic fomentations are applied for thirty-six to forty-eight hours and finally the sore is dressed with lotio rubra, until a healthy scab is formed. The scab takes some little time to separate, but no disfiguring scar remains, as happens in those cases allowed to recover without appropriate treatment.

DISSEMINATED SCLEROSIS IN THE YOUNG SOLDIER.

By Major J. HEATLY-SPENCER,
Royal Army Medical Corps.

Though a comparatively rare disease in the Army, disseminated sclerosis is one of the affections to be borne in mind when dealing with cases whose symptoms and disabilities may appear to be of functional nature. Hysterical manifestations are perhaps more commonly met with at the present day than was the case before the Great War. The diagnosis between the two diseases (which may also co-exist) is often of considerable difficulty unless special investigations are undertaken.

Recently the writer has been fortunate in meeting with another case of early insular sclerosis in a young soldier, very similar to that reported by him in the Journal of the Royal Army Medical Corps in 1923.

In March last, Signalman —— aged 19, 2nd Divisional Signals, was sent for medical opinion as a case of functional paralysis of the right anterior tibial muscles. The history was that in March, 1928, he had undergone an operation for correction of pes cavus. This consisted of transplantation of the tendon of the extensor longus hallucis into the head of the first metatarsal bone. After aseptic healing of the wound, the leg was put up in plaster for three weeks. On removal of the plaster it was noted that foot drop was present and the anterior tibial muscles showed loss of reaction to faradism. After a period out of hospital he was readmitted on October 8, 1928. No improvement in the muscular condition had occurred. "Anæsthesia" of stocking distribution was present in association with a markedly increased Achilles jerk on the affected side. Prolonged treatment by massage and electricity effected no improvement.

On examination in March, 1929, the following clinical picture was presented :—

Paresis of anterior tibial muscles resulting in foot drop (right).

A stocking distribution of anæsthesia (absent over the internal malleolus).

Reflexes.—Achilles jerk increased.

Babinski left normal. Right doubtful extensor.

No evident inco-ordination of finer movements was present, but a calligraphy test showed tendency to spread in formation of letters towards the end of a sentence. There was no evident alteration in speech, but the patient thought it was "becoming different." There had never been any alteration of vision. Some irregular lateral nystagmoid movements of the eyes were obtained on testing.

A provisional diagnosis of possible disseminated sclerosis was made and the patient sent for detailed examination of the eyes and for examination of the spinal fluid.

The report by the Eye Specialist showed normal fundi, contraction of

right visual field and some irregular nystagmoid movements, increased by repetition of the test.

The report on the cerebro-spinal fluid showed: Negative Wassermann test, normal globulin content and normal cell count (negation of syphilis) with a complete paretic curve to Lange's colloidal test. The Lange's figures read 0·0116666666.

The writer wishes to acknowledge the help afforded by Major F. R. B. Skrimshire, R.A.M.C., Ophthalmic Specialist, in the investigation of the case.

Travel.

AN OFFICER'S IMPRESSION OF THE SUDAN.

By BENEDICT.

The misfortune of a twelve-months' tour in the Sudan has been exaggerated; when Samuel Johnson wrote the following for Goldsmith he had not been outside England, but it is very true :—

> " How small of all that human hearts endure,
> That part which kings and laws can cause or cure,
> Still to ourselves in every place consign'd,
> Our own felicity we make or find."

I have indeed met people who really like the Sudan. It must be admitted that they are men who are wedded to their work, and who are not tempted like many of us by the comforts and distractions and the "happy fellowship" of mixed society. For a man who likes to be on his own and to live his own life, who dislikes any form of restraint (for example that which should be inseparable from feminine society), the Sudan offers a suitable burrow. To the Benedict it can be a sorrowful country, and the impressions it has made on one of them are reduced to words in the hope that they may help some whose tour is yet to come, in suggesting little things which make so much difference.

Nothing can be bought except in Khartoum, where prices are high; local products are difficult to obtain and are, in my opinion, one and all not worth buying. It is a surprisingly poor and unproductive country. On the other hand it should be appreciated that the leisure is beyond price. There is infinite time for reading, writing and sketching, or for learning languages, musical instruments (which must be portable, of course, e.g., the ukelele), rubbing up one's golf, especially approach-shots. On arrival in Cairo one was surprised to see golfers taking brassies in bunkers, and recovering with clean long shots on to the green; they were all men from the Sudan, I found, for there every course is entirely on sand. And finally, the compensations on one's return to Egypt that were never before even conceived are positively amazing.

For the R.A.M.C. officer, besides Khartoum, there are two out-stations both situated in the "blue," at both of which one is thrown very much on one's own devices for amusement.

Khartoum was seen only in the rosy atmosphere of friends, charity, "beat-ups," and no work, and did strike the writer as delightful for a bachelor; the green lawns, the happy trees, the Nile, the flowers, the grass tennis courts, cause the wanderer from the true Sudan a catch in his throat on arrival.

The R.A.M.C. officers' quarters, within a four-minute push-bicycle ride along the bank of the Nile to meals at the club, make existence very comfortable; each quarter has a large ceiling fan and electric light, a bath-room, which has a long bath with water laid on, and there is also a little verandah. The building is separated from the Nile by the road and a well-kept garden of lawns, trees and shrubs about forty yards in length.

There is only one possible hotel, "The Grand," £E. 62 per month for two in winter and £E. 40 in summer.

The club is exceptionally well run, but it seems to be there for the bureaucracy; there are grass tennis courts, squash court, and a very fine swimming bath. Ladies are allowed once in six months or once a week, anyhow there is a very strict rule that women are not allowed every day! But over the beauty of this oasis hangs like a pall the uncharitable, intolerant and critical spirit of the "Cathedral Close," which pervades all Sudan officialdom.

The Summer Camp, open as a rule from March to October, is at Gebeit, eighty miles from Port Sudan. It is 2,600 feet above the Red Sea, a table land of sand, rocks and stones, with a few, very few, shrubs; and heights of steep, craggy basalt frowning irritably at the lot of us. The shrubs are, they say, the top branches of trees whose roots have struggled from the depth of 120 feet (the nearest water, which in parenthesis, is full of salts, largely mag. sulph.) to express their aspirations. Here officers and troops live in E.P.I.P. tents with camp kit on a floor of muddy sand; the dust and heat and flies afford an experience one is not able to forget. But it *is* a convalescent camp, it is the best that the Sudan offers for a batch of 100 men. The place has "features," and the angry hills receive a very kindly benediction at each sunset. Whereas, the rest of the country, as we know it, is one vast flat sandy abomination, the same when you go to sleep in the train one night as you wake up to the next morning; one indeed wonders if the train has moved during the time one has slept. Even the natives, who have never known anything better, have a saying that "When God made the Sudan, He laughed," but the sunsets at Gebeit make one believe He is sorry—and divinely sympathetic and kind.

Troops pick up their health here even when living in tents—and with permanent buildings it would make a wonderful change of air camp. There are roughly eight civilian houses at Gebeit Town, which can be reached by walking one and a half miles down the railway line. These are

occupied by railway officials who everywhere in the Sudan are willing to do anything they can for us.

El Obeid is best pictured from the description of the Foreign Legion fort by P. C. Wren in "Beau Geste"! The province marches with French Equatorial Africa. Here again one lives in camp kit, but in permanent quarters.

In both stations, of course, being the British Army, we have got amenities before unheard of: tennis and golf, hockey and football, and at El Obeid, in addition, basket-ball and polo. Shooting can be had with a month's leave and an expenditure of £100; but the anxiety about food, transport, water and a hundred and one things, and the probability of malaria and ill-health, render it rather a responsible undertaking. Around Gebeit, ibex and gazelle can be had in a two days' round-trek; and in El Obeid, guinea-fowl, sand-grouse and partridge in an afternoon's motor-car trip. El Obeid is a larger place; in the winter last year there were about forty British officials and twelve wives; it is the headquarters of the Sudan Defence Force Camel Corps, and has a large Civil Government staff.

The M.O. has, however, to fill in his time. It is impracticable to reduce the staff with a view to filling his day with work.

The danger of the Sudan is not so much to one's physical health as to one's intellectual and mental health—beyond malaria at Khartoum, Atbara, and El Obeid, and sandfly fever everywhere, there are no climatic complaints on which to put one's finger.

The following aids may be of service; camp-kit is, of course, essential:—

(1) Above everything, good books; these alone can afford intellectual exercise. Novels can usually be obtained locally.

(2) A comfortable long easy-chair in rattan.

(3) Gaily-coloured mats and cushions.

(4) One's own pictures.

What can become a very great interest is a diary of one's thoughts and impressions and talks (there is a lot of conversation to be had, as it is dark at the latest at 6.30 p.m.). If this is kept from the time of leaving Egypt until one's return, and if such impressions (rather than doings, of which there is none of any interest to anyone, except perhaps on the journey) are expressed concisely in writing, not only is a large amount of material collected but the final compositions will be found suitable for publication with very little polishing; and the change in one's outlook on life in general is intensely interesting as a human document.

The discipline is excellent; because one's pleasures depend on one's "inner" self and on the companionship of the other Service exiles who are seldom more than two at out-stations, and are very much younger and junior in rank to the M.O. "The desire of pleasing and the willingness to be pleased" will be found invaluable; the resulting *camaraderie* in common isolation and, often, a permanent friendship, is well worth all the effort.

There will be many moments when the Apocrypha's text will be thought of: "My son, ask not of what profit is thy service." Moments at 9.15 a.m., when you stroll unwillingly back to your tent, with work finished and nothing necessary to be done all day, very hot, very dusty, very solitary.

Dr. Johnson says "Melancholy and depression of spirits must be diverted by every means, but by drinking. It is madness to combat with them." Hence for those of us with no outstanding artistic or literary talent the value of good books must be stressed, such books as Boswell's "Johnson," Gibbon's "Rise and Fall," the Classics generally.

The Sudan tour is not one to be avoided (and it should be an encouragement to know that headquarters endeavour to choose only the best people, both in Officers and Other Ranks!). It is interesting; for here one comes across that free, happy-go-lucky atmosphere which the typical native always produces, and which is so salutary for the strenuous, serious-minded Briton, the problems of life are seen in true perspective, and it is surprising how few of the things we worry our heads about really matter, and how vastly important those few remaining things are for development of character, for the tolerant and charitable outlook on life and people, which, after all, is what makes our world a happy place.

To attain such an attitude towards one's fellows, particularly those junior and less fortunate, is surely worth a twelve months' absence from civilization; the sameness and the solitude of the country, and the leisure, with its possibilities when intelligently used (and for which the public pays one to enjoy), have a decided influence in this direction—though, without effort, this may be a correspondingly debasing one.

THREE YEARS IN UPPER BURMAH.

By Lieutenant-Colonel G. H. YOUNGE,
Royal Army Medical Corps (ret.).

Up to the beginning of the nineteenth century the relations of Great Britain with Burmah were almost nil. About the year 1820, however, the Burmese overran and conquered Assam and were thus brought into immediate contact with the Government of India. They were not by any means good neighbours, as they made frequent attacks on our subjects and our territory, and these caused, in 1824, the first Burmese war. This lasted for two years and led to our annexing the districts of Arakan and Tenasserim. This taught the Burmese a lesson and was followed by many years of quiet. Gradually, however, the same old system of petty annoyances recurred and led to a second war in 1852. This lasted for ten months and was followed by the annexation of the Pegu District, so that since 1852 the whole of Southern Burmah has been in our hands. In 1853 King

Mindoon Min, the best and wisest king who ever ruled over Burmah, succeeded to the throne. During his reign the relations of England with Burmah were excellent. Unfortunately, he died in 1878. Whilst he lay on his death-bed Supaya, the second wife of his second son, by some means, most probably a tale of intended treachery, induced Mindoon Min to order the arrest of the whole royal family, her husband alone excepted, to the number of close on eighty. They were thrown into prison. On the death of Mindoon Min, Theebaw, the second son, as the result of a palace intrigue engineered by Supaya and her mother, was declared king. One of the first acts of his reign was to order the massacre of every one of the royal prisoners. On hearing of it the British Resident lodged a vigorous protest against such an act of barbarity. Theebaw, however, only laughed at this and answered somewhat in this wise, "I did it for the good of my country and the safety of my throne. Why on earth should *you* object?" A more or less natural result immediately followed. An organized system of slights and insults set in against everyone in Upper Burmah of English origin. Goods belonging to English merchants were seized, and several of the merchants themselves were fined without rhyme or reason.

Amongst others, the steamers of the Irawadi Flotilla Co., in whose hands was the navigation of the Irawadi, were seized and a ransom of something like £230,000 was demanded for them. Protests had no effect but made matters worse. Whilst this was going on Theebaw was intriguing with the Frenchmen in Siam, to several of whom he granted valuable concessions in Mandalay which he absolutely refused to Englishmen. Finally things became so unbearable that in September, 1885, Lord Dufferin, then Viceroy of India, sent an ultimatum to Theebaw demanding immediate redress. To this he returned an unconditional refusal, and at once published a furious manifesto calling upon the Burmese to rise and drive the English into the sea. His answer was received in Calcutta on November 9, 1885. The Indian Army is always ready for war, and so five days later, that is November 14, 1885, a force of 10,000 men reached Rangoon. They dashed up the Irawadi, taking the forts which guarded it by storm as they went. Mandalay was completely surprised and capitulated on November 27. The whole of Upper Burmah was annexed by proclamation on January 1, 1886, and King Theebaw, his two queens, and several of his court officials were deported to India, to Rutnageri in the Madras Presidency.

When we received orders to proceed to Burmah we were stationed at Calicut on the west or Malabar coast of Madras. To reach the city of Madras, which was our port of embarkation, we had therefore a two days' journey by rail.

We had a halt of twenty-four hours in Madras and so had an opportunity of seeing something of the city. It is a long, straggling, sleepy place which extends for nine miles along the coast. It has some fine buildings, including Fort George, built on the first piece of Indian soil that

belonged to Great Britain, a palatial Government House, a fine cathedral and High Court, and the most sumptuous club in India. The city does an extensive trade, the chief item being the manufacture and export of tobacco and cigars.

The harbour is, however, a very poor one, consisting only of a wretched crescentic breakwater. As the Coromandel coast is famous for its surf, ships are unable to enter the harbour during the monsoon, which is, of course, a heavy handicap to trade. When we embarked, however, the weather and the sea were perfect.

Rangoon, our port of disembarkation, is three and a half days' steam from Madras. On the evening of the second day we passed quite close to the Andamans, a group of islands some 700 miles east of Madras. The natives of these islands are about the least civilized people in the world. In size they are under five feet, they go about absolutely unclothed, have no houses and live entirely on wild fruits and berries and on the game and fish they can catch. Since 1858 the islands have been used as a penal settlement for India.

Lord Mayo, one of the greatest viceroys India has ever had, was assassinated on the islands by a Mahommedan prisoner whilst making an inspection of the penal settlement. His body was embalmed and brought back to Ireland for interment. As he had been the direct representative of the Queen in India, his funeral almost rivalled that of a reigning sovereign. One of my earliest and most vivid recollections is of being taken to see it as it passed through Dublin. It was the first military funeral I had ever witnessed, and I shall never forget the deep impression its grandeur and solemnity made on me.

Our first view of Rangoon was sufficiently dismal. We arrived soon after sunrise and found the tide full out. There we lay surrounded by steep and desolate mud banks, above one of which appeared a dazzling mass of gold. On landing, however, we found the city an interesting and important place. Although it has entirely sprung into existence since Great Britain took over the district in 1852, it is now the third largest city in India and is the centre of a flourishing trade. It contains many handsome and many quaint buildings, and a lake and public gardens which would be a credit to any city in the world. The structure which eclipses every other, however, is the Shway Dagoon Pagoda. This is situated on the only bit of elevated ground in the district, a tiny hill 166 feet in height. It consists of a gigantic central pagoda surrounded by many secondary pagodas, and rising to a height of 368 feet. It is built of solid masonry and contains in its base the robe, the staff, the drinking cup, and eight hairs of Gautama—the latest incarnation of Buddha. The Shway Dagoon is the most sacred Buddhist shrine in the world, and pilgrims flock to it from every part of Indo-China.

Mandalay, which is 300 miles north of Rangoon, may now be reached either by rail or river. In 1885, however, the railway was only open half

the distance, so that the expedition ascended by the Irawadi. There was a large flotilla of gunboats and steamers to convey the troops. These dashed up the river, surprising and capturing the forts which guarded it as they went. The troops reached Mandalay before the Burmese officers were aware that they had left India. One morning Theebaw awoke to find a strong force of British guns commanding his palace. The only course open to him was to capitulate, which he promptly did. What followed could not, I am convinced, have happened with any other army in the world than that of Great Britain. The palace at Mandalay was reputed to contain fabulous wealth in the shape of gold and precious stones. And yet for twenty-four hours the court officials, both male and female, were permitted to go in and out of it without let or hindrance to remove their personal effects. At the end of that time General Prendergast took possession of the palace in the name of the Indian Government, but the only valuables found in it were articles too heavy or too bulky to be carried away. As to the civil population, not a hair on the heads of the 250,000 men, women and children who inhabited Mandalay was any the worse for our occupation of the city. The thought has frequently crossed my mind that our soldiers are oftentimes very much misunderstood by the rest of the nation. I would therefore like to say that if one wants to see the truest courage, modesty, self-control and chivalry, there is no surer place to look for it than amidst British troops in the field. As soon as a foe is vanquished it is a point of honour with Tommy Atkins to treat him as a brother. He will even share with him his most prized possession in the field, namely, his last ounce of tobacco.

Theebaw had two wives who were sisters. He first married the elder sister, and then, at his first wife's special request Supaya, her younger sister. Supaya was a person of strong will and character, whilst Theebaw and her sister were rather the reverse. She quickly gained complete control over both and over the whole court, and ruled them with a rod of iron. She was by nature extremely jealous and extremely cruel. If one of the court ladies even raised her eyes to Theebaw's face Supaya's jealousy was at once ablaze. On the first opportunity she had the offender removed and impaled on a long pointed bamboo. The wretched victim was then hoisted into the air, the other end of the bamboo was firmly fixed in the ground and she was left quivering in the air to die in the most horrible torture. I have already mentioned the massacre of the royal prisoners after Mindoon Min's death. It is hardly necessary to say that this was Supaya's work. She had invited the prisoners to a high tea in the robing room behind the throne room. Here they were set upon and murdered. When we reached Mandalay several deep, dark stains were visible on the floor and woodwork of this room, which the Burmese maintained were caused by the blood of the murdered victims.

Theebaw's palace grounds or, as they are now called, "Fort Dufferin," are exactly one square mile in extent, surrounded by a battlemented wall

30 feet high, supported and strengthened on the inside by a vast mound constructed from the soil which was dug out of the moat. Immediately outside the wall is a broad greensward. Then comes a moat 80 yards wide, filled with water which varies in depth from 10 to 15 feet. It is said that the water in the moat is sufficient to supply the entire population of Mandalay for three years. Outside the moat is a lovely carriage drive. There are three entrances on each side of Fort Dufferin. When the foundations of these were laid it is stated that eight men were slain at each gate and their bodies buried under the foundations, so that their nats or spirits might guard the entrances for all time. According to the

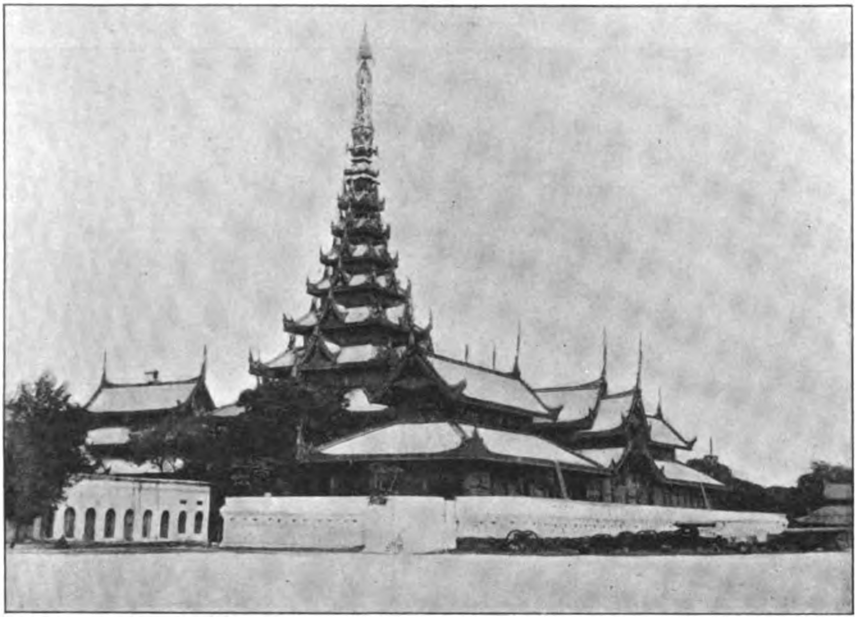


Fig. 1.—Central spire of Theebaw's palace, Mandalay.

Burmese idea this rendered the palace impregnable against all human attacks.

Theebaw's palace has lovely carvings, and a spire with the seven tapering roofs which indicate a royal residence. The Burmese believe that this spire is the centre of the universe.

Supaya's schoolroom is the loveliest structure I have seen. It is especially lovely when viewed on a clear night. The moonlight in India is of intense brilliancy, and in it this structure is a perfect dream of beauty. The woodwork is of a deep reddish brown colour and decorated with profuse and intricate carvings, the roof gleaming silver, the borders richly gilt, and let into them are innumerable tiny diamond-shaped pieces of looking glass. In the moonlight the whole structure seemed a scintillating mass of gold and silver thickly studded with diamonds.

The throne room had the golden gates through which the king and queens emerged when they appeared in public. The gates were thrown open and they stepped on to the platform in front. Immediately all present fell on their faces and so remained until permitted to rise. Woe betide anyone who failed to do so. Indeed this was a second and important reason for the prejudice against Englishmen, as our President utterly refused to humble himself in this way.

The original floor of the throne room was a superb work of art. On a background of pure white china wreaths and clusters of the loveliest roses were superbly painted. These were covered and protected by a thick layer of the finest plate glass.

FIG. 2.—Queen Supayali's schoolroom, Mandalay.

The effect of the whole was entrancing. Before I left Mandalay this lovely floor had disappeared and was replaced by a more homely one of wood. I never learned what became of it.

Inside the golden gates was the robing room where the massacre took place.

The Golden Pagoda was, without doubt, the loveliest pagoda in Mandalay, if not in Burmah.

Immediately after the capitulation of Mandalay Theebaw's army was disbanded. It was hoped that the men would return to civil life and that peace would be restored at once. This was not to be, however; large bands of them took to the jungles and became professional dacoits. These armed bands wandered over the country preying on the peaceful inhabitants. The

troops were therefore broken up into small columns whose duty it was to pursue and capture these bands of dacoits. This was no easy matter, as large tracts of the country were covered with almost impenetrable jungle through which the troops had oftentimes actually to cut their way.

This became technically known amongst them as "bush-whacking for dacoits." The paths thus made were difficult and narrow, so that the men had frequently to advance in single file. Under the circumstances it was easy for the Burmese, hidden amongst dense jungle, to shoot down our men with impunity.

Some of the Burmese ideas of warfare were curious. For instance, on one occasion they surrounded one of our columns on three sides and then

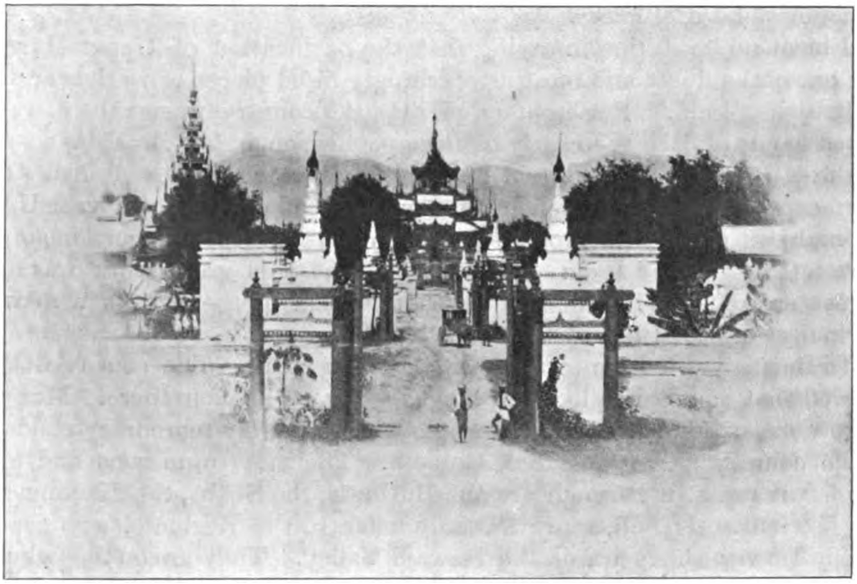


FIG. 3.—Golden Pagoda, Mandalay.

raised a fiendish row. Our men, however, beat off the attack and took a number of prisoners, including the leader. When the latter was interviewed by the C.O., he seemed rather aggrieved. He said, "Ah, Thakin, you do not play fair." The C.O. asked, "Why not?" The leader answered, "Well, Thakin, as you were surrounded on three sides it was your bounden duty to run away, but you did not run away." From time immemorial this had been the Burmese method of deciding a battle. If a force found itself in a tight place it was its duty to run away. A way of escape was *always* left open to it.

This guerilla warfare lasted for two years, and it may be of interest to describe the incident which was mainly responsible for bringing it to an end. The chief leader of the dacoits had a lovely wife to whom he was

devotedly attached. She accompanied him everywhere, as neither of them would consent to separation. One day, whilst the band were being hotly chased, this lady somehow fell heavily and fractured her thigh. There she lay unable to move an inch. The leader was in despair and utterly refused to desert his wife. Finally he walked into our camp and surrendered on condition that she was well taken care of. She was sent into the nearest military hospital, where she was carefully and skilfully treated, her husband being allowed to remain with her. When she was well again his gratitude was so great that he induced his whole band to surrender, and he himself became one of our greatest assets in the settlement of the country. This is only one of innumerable instances where the work of our Army medical officers has been of more service to the Indian Government than whole brigades of soldiers.

I have no hesitation in saying that the pacification of Upper Burmah was one of the finest and most astonishingly rapid pieces of work ever done by British officers. For eighteen months the country was at the mercy of armed bands of dacoits—nearly half the population, indeed, lived by preying on the other half. By the end of the second year these bands had either been captured or had surrendered. By the end of the third year Upper Burmah was one of the most peaceful and most prosperous portions of the British Empire, and I am proud to say that this great work was done almost entirely by Irishmen. Five out of six of the officers who were originally employed there came from Ireland.

In Burmah as known to us there are many races. The census of 1911 showed that something like 120 languages were spoken there. Many of these were, of course, spoken by people who were only temporary residents in the country as, for instance, Chinese. The most numerous and most important races in Burmah are the Burmese, the Shans, the Kachins and the Kareens. I shall, however, only refer to the Burmese, who occupy chiefly Lower Burmah and the Irawadi Valley. They are on the whole a strange mixture. In appearance they bear a close resemblance to the Japanese, but in character and disposition two people could scarcely be less alike. The Burmese are absolutely averse to discipline, so that they make the poorest possible soldiers. As a people they are merry, light-hearted and hospitable and devote a large proportion of their income to charity. To one in real need many of them would not hesitate to give away their last rupee. On the other hand, to an enemy in their power they are inhumanly cruel, no torture being too fiendish for them to inflict. Their favourite method of procedure was as follows: Two strong bamboos, bound together in the form of the letter X, were firmly driven into the ground. Stout cords were fastened round the victim's wrists and ankles, and the legs and arms were violently dragged outwards until the hips and shoulders were dislocated. They were then bound to the bamboos, care being taken that the unhappy wretch was so placed that the scorching sun fell full on his face. A can of water was placed by his side, his eyelids were cut off and he was

left to die a death too horrible even for imagination. Our men and officers never failed to keep a cartridge handy so that they might quickly terminate their existence were they unfortunate enough to fall into the hands of such an enemy.

The country is delightful in many ways. Indeed, it would be perfect were it not for the rainy season. The monsoon in Burmah is peculiar in this, however, that after some hours of torrential rains, which almost resemble the bursting of a waterspout, the sun blazes out like a furnace day by day so that the air becomes supersaturated with moisture. For this reason five months of the year resemble a life in the hottest chamber of a Turkish bath. Perspiration streams from one's body day and night. This brings out such a virulent "prickly heat" that the skin becomes like a raw beef-steak. The itching is oftentimes unbearable. Indeed, I have known it so bad that the sufferers actually *dare* not lie down at night-time.

Burmah is the paradise of the shikaree or sportsman. The record bag of snipe for the world has been made there. Big game also abound in the hill districts. The thamin is an antelope peculiar to Burmah and has quite unique antlers. A circular piece of horn juts straight out from the forehead for about two inches. From the under surface of this grows a brow-antler, and from the upper surface a super-antler. These increase in length until together they form almost exactly two-thirds of a circle. Then from the tip of the super-antler there bud out three short tines.

Current Literature.

J. INDUST. HYG. 1928, v. 10, 117-27, 3 figs. **Recent Experience of the Public Utilities of the United States and Canada in the Use of the Schäfer Prone Pressure Method of Resuscitation in Cases of Electric Shock.**

DRINKER, C. K. **Acute Asphyxia as a Medical Problem.** *J. Amer. M. Ass.* 1928, v. 90, 1263-7, 3 figs. [11 refs.] [Harvard School of Public Health, Boston, Mass.]

Three great emergencies, according to C. K. Drinker may create acute asphyxia: drowning, electrical shock and carbon monoxide poisoning. Nerve cells resist deprivation of oxygen for varying periods, from 8 minutes for the small pyramidal cells of the cerebrum, 13 minutes for Purkinje's cells of the cerebellum, to 20-30 minutes for the medullary centres, while the spinal cord and the sympathetic ganglia may survive up to one hour. The higher the function of the nerve cell, the quicker does it succumb. Resuscitation after asphyxia may be effected, although destruction of cells in the higher cerebrum has occurred. Whatever be the cause of asphyxia, Schäfer's prone method of resuscitation should always be used. Electric shock may suspend breathing but leave the heart beating, or the heart may

be stopped and breathing may be present, or both breathing and the heart may have ceased together. The favourable cases are those in which the heart is still beating. In cases of carbon monoxide poisoning the breathing fails before the heart. Here the toxic cause requires to be got out of the blood to enable the normal processes of life to be re-established. In this case oxygen is of value, and also carbon dioxide to stimulate the respiratory centre to activity. Inhalation of more than 60 per cent. of oxygen, if continued for long, is dangerous, since pneumonia may follow later. Information has been brought together regarding the experience from the use of the Schäfer method of resuscitation in cases of electric shock. Medals are given in America and Canada as an expression of merit in cases of successful resuscitation from electric shock. Information required in awarding 265 of these medals is the basis of a report by the Engineering Committee of the Conference on electric shock. The conclusions are arrived at that the duration of contact with the current decides to a great extent whether or not resuscitation will be successful; that immediate application of resuscitation after shock is extremely important; and that it should be continued until rigor mortis has set in. All mechanical respiration devices are unanimously condemned on account of the inevitable delay before they can be brought into action. The simplicity of the Schäfer method places it ahead of such devices as the lungmotor and the pulmotor. A greater percentage of successful cases occurred when the shock was at high voltage. On an average resuscitation was found to take place from 15-20 minutes after treatment was commenced. A standard technique for artificial respiration by the prone pressure method has now been adopted in the United States and in Canada; the standardized text is given together with three simple pictures. [Advantage would be gained if such organizations as the St. John and St. Andrew's, as well as the Red Cross Association, in this country, were to adopt the standardized text given.]

E. L. Collis.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 5.

Drinker, C. K. **New Apparatus for Artificial Respiration: the Barospirator of Professor T. Thunberg.** *J. Indust. Hyg.* 1928, v. 10, 7-12, 3 figs. [11 refs.]

Various mechanical contrivances have been devised for carrying on artificial respiration. Practically all have now been discarded as inferior in their action to the method introduced by Schafer. But the author in this paper gives a clear description of a novel and fascinating method recently devised by Thunberg. The principle of the device, which is called a barospirator, is as follows: The individual is placed in a sealed chamber; then by use of a pump the pressure of the atmosphere in the chamber is first increased and then decreased at the ordinary rapidity of respiration. Soon all respiratory movements cease. The required oxygen

is pushed into the blood by the increased pressure while the unwanted carbon dioxide is withdrawn when the pressure is lowered. No need, therefore, exists for the patient to exert respiratory movements, and in fact he does not. In practice it is found that the operation of the pump at a rate of 25 strokes a minutes with a setting of the stroke so as to give pressure variations of ± 55 mm. Hg works well. The only subjective sensation experienced is at first an unpleasant feeling from the ears, due to the rapid rise and fall in pressure, but this soon ceases to be an annoyance. The value of this device at present cannot be estimated. Barospirators must be rather cumbersome affairs; but when a long struggle is at hand to maintain artificial respiration after electric shock, gas poisoning or drowning, the value of such an apparatus might be great. The author considers that the undoubted efficiency of the barospirator makes it certain to come into use. [See description by Schmidt of somewhat similar apparatus, this *Bulletin*, 1927, v. 2, 318.]

E. L. COLLIS.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 5.

GABBI, U. Sul potere patogeno nell' uomo del bacillo di Bang. [**Pathogenic Action of Bang's Bacillus in Man.**] *Giorn. di Clin. Med.*, 1928, v. 9, Supp. to No. 16, 3-15. [Royal Inst. of Clin. Med., Univ., Parma.]

PONTICACCIA, L. Febbre ondulante umana ed aborto epizootico. [**Undulant Fever in Man and Epizootic Abortion.**] *Ibid.* 16; 19-34, 3 figs.

VERCELLANA, G. L'azione patogena del bacillo di Bang per il genere umano è dimostrabile sperimentalmente? [**Is the Pathogenic Action of Bang's Bacillus Demonstrable Experimentally?**] *Ibid.* 37-44; 47-54; 57-62. [Inst. of General Path., Univ., Parma.]

LORENZANI, G. Epidemia famigliare da infezione da B. di Bang. [**Familial Epidemic of Infection with Bang's Bacillus.**] *Ibid.* 63-4; 67-72.

With the exception of Vercellana all the above authors, in a special issue of the *Giornale di Clinica Medica* devoted to the relations between *Brucella melitensis* and *Brucella abortus*, maintain that human undulant fever and epizootic abortion are closely allied as regards ætiology, epidemiology and prophylaxis.

Gabbi's article contains a review of the literature from 1916 to October, 1928, relating to human infection with *Br. abortus*. The persons affected have been veterinary surgeons, slaughterers, owners of infected cattle and laboratory workers, and those who drank infected milk.

Ponticaccia points out that *Brucella melitensis* and *Brucella abortus* are organisms belonging to the same strain, and that they possess in common

the same morphological, cultural, biochemical, serological, allergic and pathogenic properties to almost all species of domestic animals. *Brucella melitensis* differs from *Brucella abortus* as it has had its virulence for monkeys and human beings exalted through passage through a goat, whereas *Br. abortus* has had its virulence attenuated or lost by passage through a goat.

According to Vercellana *Brucella melitensis* is the most frequent, formidable and important cause of undulant fever in man, and may also be the cause of abortion in animals, while *Br. abortus* is the most frequent, formidable and important cause of epizootic abortion, and is also probably the cause of some cases of human undulant fever. Human beings are liable to contract undulant fever not only from goats, but also from cattle, and the risk is greatest when the animal has recently aborted for the first time and the products of abortion are carelessly handled.

Vercellana inoculated 4 volunteers with two milliards of *Br. abortus* derived from eight different strains, but without giving rise to any symptoms. Nicolle, Burnet and Conseil in 1923 had also failed to reproduce the disease by inoculation of 5 persons with cultures of *Br. abortus*. Vercellana also gave 25 healthy persons milk to drink which was rich with living and virulent *Br. abortus*, and some of them who had cracks on their hands handled the placenta, milk and urine of infected goats but in none of the cases did any symptoms develop.

Lorenzani describes an outbreak of undulant fever in a family in which the father, mother, son and daughter were affected after drinking the unboiled milk of a cow which had aborted. The father had also helped to deliver the cow.

J. D. Rolleston.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 6.

Debré, R., Marie, J. & Pretet, H. Le diagnostic bactériologique de la coqueluche, sa facilité et son intérêt. **[Bacteriological Diagnosis of Whooping Cough.]** *Presse Méd.* 1929, v. 37, 18-20.

The authors emphasize the importance of recognizing an ordinary attack of whooping cough in the early stage and in detecting atypical cases in view of the fact that the disease accounts for the death of more than 3,000 children annually in France, and even that figure considerably underestimates the real mortality. During the last 2½ years the authors have employed the method of Mauritzen, Chievitz and Meyer, of Copenhagen.

This consists in holding Petri dishes containing the Bordet-Gengou medium of potato blood-agar 10 cm. from the child's mouth for a quarter of a minute during 3 or 4 attacks of coughing, and examining the colonies on the 2nd or 3rd day, when they appear as small shiny, hemispherical drops 1 mm. in diameter on the surface of the medium. They can further

be identified by microscopical examination when cultivated on blood-agar or by agglutination.

The authors' observations, which accord with those of the Danish bacteriologists and of LAWSON and MÜLLER of Boston, are as follows: The Bordet-Gengou bacillus is not found except in cases of definite or incomplete whooping cough. In typical whooping cough cultures are most likely to be positive in the catarrhal stage. Positive results were obtained by the Danish observers in 75 per cent., by LAWSON and MÜLLER, and by the authors in 3 out of 4 cases. Three weeks after the onset of the paroxysms the percentage of positive results falls to 45 per cent., and two weeks later a positive result is obtained in only one out of 10 cases.

The Danish Government, since 1916, have sanctioned the work of MEYER and CHIEVITZ and permitted the return to school of whooping cough patients after the paroxysms have lasted 4 weeks. Experience has shown that though the presence of the bacillus is a necessary condition, it is not by itself sufficient to determine contagion.

The fact then appears to be established that whooping cough ceases to be contagious at the end of the 4th week of the paroxysmal period.

J. D. ROLLESTON.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 6.

IBRAHAM, H. M. & SCHÜTZE, H. **A Comparison of the Prophylactic Values of the H, O and R Antigens of *Salmonella aertrycke*, together with some Observations on the Toxicity of its Smooth and Rough Variants.** *Brit. J. Exper. Path.* 1928, v. 9, 353-60. [5 refs.] [Lister Inst., London.]

The authors have immunized batches of mice with vaccines of *Bact. aertrycke*, prepared in such a way as to afford differentiation between the effect of the O and H antigens; and have tested their resistance by injecting 0·5 c.c. of a 1 : 20 dilution of a 24-hours' broth culture of *Bact. aertrycke* intraperitoneally, 14 days after the last of three immunizing injections of vaccine. Fourteen mice were immunized with a vaccine prepared from a smooth strain and heated to 60° C. for 1½ hours—containing both O and H antigen: of these 50 per cent. were alive 80 days later. Fifteen mice were immunized with the same vaccine heated for 2 hours at 100° C. in which the H antigen would be greatly reduced: of these 20 per cent. were alive 80 days later. Fifteen mice were immunized with the same vaccine heated for one hour at 100° C.: of these 33 per cent. were alive 80 days later. Fifteen mice were immunized with a vaccine prepared from a rough variant, and hence containing no O antigen; the vaccine was heated for 1½ hours at 60° C., and thus contained the same H antigen as in the previous series, and the rough heat-stable antigen; of these 15 mice only one was alive 14 days later. Of 14 mice immunized with the same vaccine heated for 2 hours to 100° C.,

all died within 14 days. Fifteen control, unvaccinated mice were injected with the same test dose, 2 with 1/5th this dose, 2 with 1/50th and 2 with 1/500th; all died within 80 days, and all but one within 14 days. The authors conclude that only vaccines containing the H (flagellar) and O (smooth somatic) antigens in an agglutinogenically active form are fully effective, though vaccines containing the O antigen alone give rise to a definite increase in resistance, evidenced by delayed death. Vaccines containing the H antigen together with the heat-stable rough somatic antigen, or the latter antigen alone, are ineffective. They enter a caveat that these experiments do not exclude the possibility that the prolonged heating at 100° C., employed to destroy the thermolabile H antigen, may have caused a deterioration in the O antigen. [The numbers of mice in the various groups are small, though many of the differences observed are clearly significant.]

W. W. C. Topley.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 7.

Gardner, A. D. **The Small-Flaking or "O" Agglutination of Permanent Standardised "O" Suspensions of *B. typhosus* by the Serums of Normal Inoculated and Infected Persons.** *J. of Hyg.* 1929, v. 28, 376-93, 1 chart. [21 refs.] [Sir William Dunn School of Path., Univ. Oxford.]

In this paper the author discusses certain points at issue, with regard to the relation between H and O agglutinins in the serum of infected and inoculated subjects. It has been stated that inoculation with T.A.B. vaccine does not give rise to any production of O agglutinins. The author's observations on this point may be adequately summarized by reproducing a table showing the results obtained with 87 samples of human serum, and a chart showing the course of events following the administration of two doses of T.A.B. vaccine to a healthy adult, who had received previous inoculations 13 years earlier.

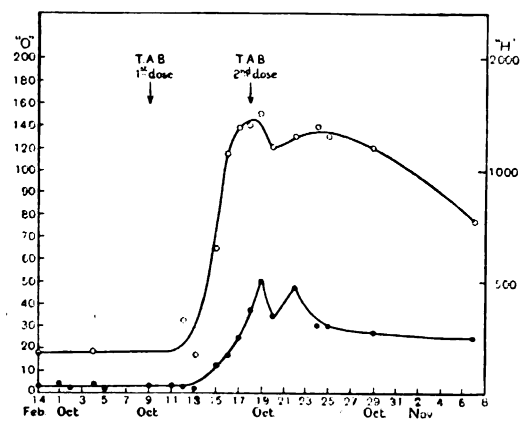
These observations are of great importance in view of statements which have been made with regard to the significance of the two types of antibody; and we may quote the author's remarks concerning the relation of his findings to those of others.

"Felix's experience that the serums of inoculated persons do not effect the small-flaking agglutination of living typhoid bacilli at a dilution of 1 in 100, coupled with his view that the 'O' substance and antibody are the only really important immunological substances concerned in infection and immunity, led him to the conclusion that inoculation against typhoid fever is worthless. . . . But since the experiments described above prove that antityphoid inoculation does stimulate a production of 'O' agglutinin in human beings, just as in rabbits, the theoretical ground for Felix's somewhat revolutionary theory disappears. . . . We may accept the fact that,

with his technique, the 'O' agglutination of inoculated persons practically always fails at 1 in 100, whereas that of typhoid fever patients, almost without exception, exceeds that figure at some stage of the disease. But this does not mean that inoculation has had no effect, nor is there any law by which an antibody must be present in a concentration of more than 1 in 100 before we are entitled to consider it of immunological importance. It is therefore clear that, whatever the significance of the 'O' agglutinin may be, we cannot admit the truth of any theory based on its absence from the serum of inoculated persons."

TABLE II.—THE STRENGTH OF SMALL-CLUMPING (O) AGGLUTINATION OF *B. typhosus* IN EIGHTY-SEVEN HUMAN SERUMS OF VARIOUS GROUPS.

"O" titre (dilution of trace readings)	Normal. No evidence of inoculation	Inoculation in the past		Recent inoculation (4 weeks ago)	Typhoid fever		Standard "O" units
		Probable	Certain		On clinical and sero-logical evidence	Bacterio-logically proved	
0-15	24	3	2	—	—	—	0
20-50	22	5	2	4	1	—	0·5-2·0
55-200	1	2	1	4	1	1	2·5-8·0
250-800	—	—	1	3	2	2	8·5-32
950-3,200	—	—	—	—	1	2	33-120
3,500-10,000	—	—	—	—	2	1	Over 120
Total	47	10	6	11	7	6	—



Curves of results of T.A.B. inoculation of a healthy adult previously inoculated with T. vaccine in 1914 and with T.A.B. vaccine in 1915. The upper curve shows the large flocculating "H" agglutination and the lower curve the small-clumping "O" agglutination of *Bact. typhosum*.

[Reproduced from the *Journal of Hygiene*.]

While not accepting Felix's views with regard to the entire uselessness of the repeated determination of the H agglutinin titre, the author fully agrees that the O agglutination test is capable of great service in proving the nature of enteric infection in persons whose residual H agglutinins

complicate the conventional Widal reaction, and that, in such cases, it is likely to prove an easier and more reliable test than the tracing of H agglutination curves.

W. W. C. TOPLEY.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 7.

HADLEY, P. **The Twort-d'Herelle Phenomenon. A Critical Review and Presentation of a New Conception (Homogamic Theory) of Bacteriophage Action.** *J. Infect. Dis.* 1928, v. 42, 263-434. [372 refs.] [Hygienic Lab., Univ. of Michigan, Ann Arbor.]

In an earlier review, noticed in this *Bulletin*, 1927, v. 2, 437, the author presented an extensive survey of the literature dealing with microbic dissociation. In the present paper he surveys, with almost equal wealth of detail, the available data with regard to the Twort-d'Herelle phenomenon, adding, as before, a considerable number of original observations. The second review is, indeed, a logical sequel of the first; for the author is a strenuous upholder of the intimate association between the two phenomena, and clearly foreshadowed in his first communication the tentative hypothesis which he elaborates in the second. Rejecting alike the view that the bacteriophage is a living virus, foreign to the bacterial cell and preying on it, and the view that it is a non-living agent, enzymic or other, which induces a transmissible autolysis wholly dysgenic in its results, he would regard this form of so-called bacterial lysis as the expression of an accessory, or alternative, mode of bacterial propagation, associated with some particular stage of the cyclic development of the bacterial cell. It is admitted that, in the present state of our knowledge, such a conception must be stated in somewhat nebulous terms, and beyond these the author does not go. Accepting, in agreement with the majority of recent observers, the corpuscular nature of the bacteriophage, he rejects the virus hypothesis, for reasons which he specifies in detail, and seeks for possible alternatives. He says:—

"If it is not the corpuscle of a filterable virus, there is only one aspect of bacterial behaviour in which one might hope to find a protoplasmic unit conforming to the requirements of the bacteriophage; and that is the reproductive mechanism. . . . If there exists, among the cell elements supporting these dimly discerned, reproductive processes, a minute corpuscle which has the power of inciting not only cell proliferation but also a certain sort of cell 'disintegration,' and which, at the same time, increases at the expense of the process which it instigates, it is natural to postulate such a corpuscle as an element possessing some sort of fecundating significance. It must be able to effect a conjugation with, or perhaps fertilization of, the young, susceptible cells. In such a case, the corpuscles themselves might not have the power of independent propagation in any medium. They might possess only the ability to incite the fecundated cells, not merely to development (for that will doubtless occur in any case),

but to development in a certain line. . . . Such a phenomenon would not be new in biology, for certain instances are already known in which the future mode of development and reproduction is determined by the presence or absence of opportunity for fecundation. The cell, whether fecundated or unfecundated, will develop; but the results of the process will be different in each case."

To those who have accepted uncritically D'HERELLE's conception of a single bacteriophage, readily adaptable to each and all bacterial species which are susceptible to transmissible lysis, such a conception is, of course, untenable; but the author has no lack of support in his rejection of this unitarian view, and in his insistence on the relatively narrow specificity of the lytic principle, and its close association with antigenic structure as revealed by serological reactions. As he rightly emphasizes, the recent observations of BURNET [*infra*] are particularly significant from this point of view. There is, on the other hand, little doubt that the activity of a single "strain" of bacteriophage does overstep the recognized limits of the bacterial "species" from which it was derived; and this difficulty is not evaded.

"To answer this difficult question involves an even more far-reaching speculation, but I may put the matter in the following form. Is one at present justified in denying the existence of bacterial hybridization? . . . Although I can see little ground for accepting such a view at present, only on such a basis can the heterologous action of the lytic corpuscles be explained in the terms of the present theory."

[Whether one accords the author's hypothesis a provisional acceptance, rejects it as untenable, or regards it as an interesting and stimulating speculation, one can only feel gratitude for the critical presentation of a mass of data, which few of us can digest and assimilate *in toto* for ourselves. In reading this review, and in consulting the original records, it is impossible to avoid being struck by the flat contradictions as to matters of fact, which are so frequently in evidence. It seems highly probable, as the author himself concludes, that our confusion is, in part at least, referable to inadequate technique. One is tempted to suggest that this is particularly true with regard to the direct observation of the morphological changes associated with the so-called "lysis." If we could get a true picture here, our difficulties would probably be well on the way to solution. If one may venture on one specific criticism, it may be suggested that the author's interpretation of the S→R variation, and its association with the bacteriophage phenomenon, would be contested by many observers; though none would deny the association of transmissible lysis with microbial dissociation. The general identification of the Rough variant with the bacteriophage-resistant form even if we limit this to the large-plaque-forming lytic principle, will hardly obtain universal acceptance; nor is it in accordance with general experience to describe the Smooth variant as characterized by the possession of a dominant heat-labile antigen, and the Rough type as

characterized by the possession of a dominant heat-stable antigen. In those species, in which the dual antigenic structure has been most clearly demonstrated, the change over from S to R appears to be associated with a change in the nature of the heat-stable antigenic element, perhaps in the complete replacement of one heat-stable antigen by another, while the heat-labile antigens appear to be identical in the two forms.]

W. W. C. Topley.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 7.

Burnett, F. M. **"Smooth-Rough" Variation in Bacteria in its Relation to Bacteriophage.** *J. Path. & Bact.* 1929, v. 32, 15-42. [23 refs.] [Lister Inst., London.]

The appearance of resistant bacterial variants, during the action of a lytic filtrate on a sensitive bacterial culture, is one of the most striking and significant phenomena associated with bacteriophage lysis. In the present communication the author records an extensive series of experiments bearing on the relation of antigenic structure to phage-sensitiveness among such variant strains. In an earlier paper (this *Bulletin*, 1928, v. 3, 94), he had been able to demonstrate a close relationship between phage-sensitiveness and the nature of the heat-stable, polysaccharide, somatic antigen—the O antigen—when different lytic principles were tested against different bacteriological species, or serological types, within the Salmonella group. Thus, certain phages, which were active against the normal smooth form of *Bact. enteriditis*, were found to be active against the corresponding forms of *Bact. typhosum*, *Bact. pullorum* and *Bact. gallinarum*, possessing

Table II.—Characteristics of the Resistant Strains derived from 398 S with Phage 12.

Strain	Precipitating saline concentration	Agglutination S.	Agglutination R.
Normal S	> 5 per cent	5,120	< 80
R1 (true rough)	0·8 ,,	< 80	10,240
R7	0·8 ,,	2,560	10,240
R3	0·6 ,,	10,240	5,120
R2	> 5 ,,	5,120	5,120

Strain	Phage sensitivity														
	1	12	33	8	18	28	31	34	20	25	35	32	11	13
Normal S	+++	+++	+++	+++	0	0	0	+++	+++	+	0	+++	0	0
R1	0	0	0	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
R7	0	0	0	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++
R3	0	0	0	+++	+++	±	+++	+++	+++	+++	+++	+++	0	0
R2	0	0	0	+++	+++	+++	+++	+++	0	0	0	0	0	0

a common O antigen, but not against species or types possessing a different O antigen, nor against variants of the above species in which the O antigen was absent. In the present series of experiments resistant variants have been derived from sensitive strains by submitting them to the action of a

particular phage; and these variant strains have then been tested as regards their sensitiveness to other phages, their sensitiveness to salt-agglutination, and their antigenic structure as revealed by their agglutinability with smooth and rough antisera. The lytic principles employed, fourteen in number, were divisible into four main groups, on the basis of their activity against the different variants. Members of the first group were active only against the normal smooth form; those of the second and third groups were active against both smooth and rough strains, but showed minor differences in their behaviour. The fourth group were active only against the rough variants, with well-developed R (or ϕ) antigen. The general type of the results obtained is sufficiently illustrated by the protocol recorded in Table II, which sets out the behaviour of four resistant variants derived from a sensitive smooth strain of *Bact. gallinarum* (398 S) under the influence of phage 12.

The predilection of phages 1, 12 and 33 for the normal smooth form, and of phages 11 and 13 for the rough variants with a well-developed R antigen is clearly evidenced, while the second and third groups of phages are differentiated by their action on the variant R_2, which is stable in saline but responds well to both S and R antisera.

The complete series of observations recorded, for the details of which reference must be made to the original paper, enable the author to draw several important conclusions with regard to the general problem of bacteriophage lysis. Thus, d'Herelle adopts the view that resistant variants arise as the result of an immunity acquired by individual bacterial cells, which have successfully resisted invasion by a phage particle, this immunity being passed on to their descendants. On this view it might be expected that the variants derived from a single sensitive strain under the action of a single phage would be identical in their behaviour towards other phages: this is not the case. On the hypothesis sponsored by Bordet and Gratia, on the other hand, according to which the appearance of resistant variants is the result of simple selection of resistant cells pre-existing in the bacterial population submitted to phage-action, the only common factor to be expected amongst the secondary strains would be resistance to the phage in response to which they have appeared. The results actually obtained are in entire accord with this expectation. [This argument cannot, perhaps, be pushed very far, since variants which differed in other respects might all be capable of acquiring a resistance towards a particular phage.] Subsidiary experiments, designed to throw further light on this point, yielded results telling strongly in favour of the selection hypothesis. It was found that the number of resistant colonies developing from the action of a given phage on a given bacterial strain varied in proportion to the number of bacterial cells sown on the plate-culture, but were almost uninfluenced by variations in the concentration of the phage, over the range employed.

The general results of the author's experiments may also be applied

to the criticism of Bail's hypothesis, according to which any one phage type represents a particular unit (or gene) in the hereditary make-up of the sensitive bacterial cell, which has become so altered as to exert a disintegrative effect on any cell in which this particular gene is present. According to this view, the resistant variants arise as the result of the loss of this unit from the genetic make-up. It would appear to follow that any series of phages belonging to a single type in Bail's sense—all producing from a single bacterial strain resistant variants that are equally resistant to all the others—should behave identically when tested against other bacterial strains. On d'Herelle's hypothesis of the autonomous individuality of the phage, any differential character of a particular lytic principle will be maintained, perhaps with slight adaptive modifications, when the phage is developed at the expense of any sensitive species. The experiments recorded in the present communication include instances in which different phages, belonging to a single type in the above sense, could be sharply differentiated by their action on other bacterial strains.

Among subsidiary points of interest which emerge from this investigation, we may note the frequent appearance of typical smooth strains among the resistant variants derived from a rough strain under the influence of bacteriophage lysis.

W. W. C. Topley.

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Reviews.

Heart Disease in Childhood. By H. B. Russell, M.D., M.R.C.P., and C. K. J. Hamilton, B.M., M.R.C.P. London: Constable and Co., Ltd. 1929. 8vo, pp. vii + 104. 1 plate. Price 7s. 6d. net.

We have come to expect in the modern medical monographs, of which series this is the latest, a clear and succinct account of the modern views on the subjects with which they individually deal. The present volume meets our expectations.

No startling new theories are propounded to mystify us, but we finish our reading with the feeling that we have a satisfactory knowledge of the essentials of heart disease in childhood; that we feel the authors generally confirm our previous views perhaps adds to our appreciation.

Written in an easy style, with a pleasing absence of the unnecessary, the various chapters deal with the causation, symptoms, prognosis and treatment of the several diseases and disorders that may affect the heart in childhood.

The authors, in their preface, refer to the big proportion of the book that is occupied with the consideration of rheumatism. That practically

all disease of the heart in young people is the result of rheumatic infections—the proportion due to congenital lesions, etc., being comparatively negligible—should stimulate the movement for the eradication of the disease, or at least for the minimizing of its results.

The chapter on treatment is of the greatest value, especially in its precise information as to the length of the period of rest in bed necessary after the appearance of endocarditis. The authors are sceptical as to the value of salicylates in curing such a condition; with their view few will disagree.

One chapter is devoted to the interpretation of electrocardiograms, and, in an appendix, the technique of exploration of the pericardium and of venesection is described.

PERNICIOUS ANÆMIA. By Beaumont S. Cornell, M.B.Tor. Published in Great Britain for the Duke University Press by the Cambridge University Press. Pp. 311. Price 20s. net.

The book is a complete review of the literature combined with Dr. Cornell's own clinical and laboratory studies on the subject of pernicious anæmia. The differential diagnosis of the disease and its pathology are thoroughly discussed, and the book contains much interesting information on the geographical distribution of this disease. The successful "liver" therapy of Minot and Murphy is presented in detail with suitable diets. At the end of the book there is a most complete bibliography with 827 references. The American spelling throughout may annoy but the book is without question well worth reading. It strikes one more as a critical *résumé* of all that has been said on the subject rather than as an actual study of the disease by the author. An unusual feature is a preface for the non-medical reader, and in it the author admits that the exact process of disease which causes pernicious anæmia is just about as obscure to-day as it was in 1822, when a doctor in Scotland described the first recorded case. In our opinion Dr. Cornell's book will focus even more attention on this very baffling disease and help towards its elucidation.

A. C. H. G.

A TEXTBOOK OF PULMONARY TUBERCULOSIS FOR STUDENTS. By R. C. Wingfield, B.A., M.B.Oxon., F.R.C.P. London: Constable and Co., Ltd. 1929. Pp. xvi + 401. Price 31s. 6d. net.

A recent study of the incidence of pulmonary tuberculosis in the Army has brought out the fact that a considerable proportion of the cases occur in recruits or young soldiers of less than one year's service. It is conceivable that some of these young soldiers had no clinical evidence of the disease on enlistment, but, on the other hand, it must be admitted that it should have been possible to eliminate many of them at the recruiting medical examination.

This observation is evidence of the well-known difficulty of diagnosing

pulmonary tuberculosis in its early stages, and has called attention to the present-day lack of experience in the diagnosis of tuberculosis outside the tuberculosis medical service itself. In consequence it has been urged that recruiting medical officers should be given a special course in tuberculosis.

It is of interest, therefore, to see that the author of this book has realized the situation created by the development of our national scheme for the prevention and treatment of pulmonary tuberculosis.

". . . . the tuberculosis scheme, by segregating the consumptive for observation and treatment into the municipal dispensaries, special departments of general hospitals, and special institutions, has largely removed that disease from the general departments of our teaching hospitals just at the time when it is more important than ever that the student should have every chance to study it."

It is foreseen that in future a compulsory course in tuberculosis may be instituted, as is the case with specific fevers. At the present time, however, the student must take a special voluntary course if he desires to study tuberculosis. It is to assist such that this book has been published, and it is intended to be a practical textbook "to fill a gap between classics . . . . and the shorter descriptions of the disease in the textbooks of general medicine."

The book can be thoroughly recommended as a comprehensive survey of the whole subject, including etiology, epidemiology, symptomatology, diagnosis, treatment and after-care. Due consideration has been given to the modern views on these various points, but evidence of the author's extensive practical experience is noticeable throughout, particularly in the chapters on diagnosis and treatment, so that a well-balanced and practical textbook has been produced.

The book is amply illustrated with charts and reproductions of radiograms (illustrations 92, plates lii).

THE PRINCIPLES OF CLINICAL PATHOLOGY IN PRACTICE. By G. Bourne, M.D., M.R.C.P., and K. Stone, M.D., M.R.C.P. Oxford Medical Publications, Humphrey Milford. Oxford University Press. 1929. Pp. x + 392. Price 16s.

In their preface, the authors rightly stress the importance of the proper interpretation of laboratory reports by the practitioner. As we know quite well, laboratory reports are not always beyond criticism in their clearness; some are even frankly mysterious. This very excellent book, unique in its way, should help to make these "difficult" reports clear.

The book is arranged according to the diseases of the various systems. There is a valuable appendix on the collection of pathological material and the proper method of forwarding specimens. There is an excellent index. The book is handy and is very well printed. By way of criticism we note that *Bacillus fæcalis alkaligenes* is looked on by the authors as a purely saprophytic organism; it is not even mentioned under organisms which

have been obtained from the blood. Those of us who have served in India would, we think, hardly agree with this. We can, however, find very little to disagree with in the authors' general opinions. It is a valuable book and a step forward in bringing the laboratory to the patient. We can confidently recommend the book to all officers of the Corps.

A. C. H. G.

MODERN METHODS OF FEEDING IN INFANCY AND CHILDHOOD. By Donald Paterson, B.A., M.D., M.R.C.P., and J. Forest Smith, M.R.C.P. London: Constable and Co., Ltd. Second Edition. 1929. 8vo. Pp. xi + 149. 7s. 6d. net.

When this work first appeared in 1926 it soon established itself as one of the most useful books we have on the subject of infant feeding. We consider that it attained this position by virtue of its being so eminently practical, and giving such lucid answers to the problems in feeding that so frequently confront the physician dealing with children.

In the new edition, without adding appreciably to the size of the volume, much has been introduced with the object of increasing its usefulness—a chapter on diets for sick children and children of school age, a section on stools in infancy and a description of the common articles of diet, with their uses and digestibility. The edition has been brought up to date by the re-writing of the section on vitamins, on condensed milk and the artificial foods, and the instructions for the preparation of lactic acid feeds.

It is remarkable how much has been written during the past few years with regard to the dieting of children; of this the authors have obviously made an exhaustive study, and chosen the most useful for incorporation in their writing.

The same good qualities that characterize the previous edition are even enhanced in this. We have found the former invaluable in our practice, but shall now give the new one the pride of place by our elbow.

L'EMPOISONNEMENT PAR LES CHAMPIGNONS. By Dr. E. Martin-Sans. Paris. Librairie Paul Lechevalier. 1929. Pp. 247.

A very excellent and complete work on what one might call "the medically important fungi," i.e., those poisonous fungi which resemble edible species and may be eaten in mistake for them. Most fungi are at any rate harmless; some are a pleasant and a valuable food; of the harmless species not many are commonly eaten. Only a few species are poisonous, and their recognition is not a matter of great difficulty and can be taught to the uneducated. Dr. Martin-Sans, in the introduction to his book, suggests therefore that, under proper supervision, many fungi might well become useful adjuncts to the diet and prove valuable to soldiers on the march. As far as our Army at home is concerned, this application would, it is feared, be very limited, but on the Continent of Europe that might not be the case. In this book the poisonous fungi are first grouped

according to the type of their pathogenic properties. Idiosyncrasy and prophylaxis are briefly discussed. A botanical classification is then given with excellent keys for the identification of species. With this book there should be no difficulty in determining the genus and species of any poisonous fungus. Each botanical family is then considered separately, and the differential diagnosis of the symptoms they may produce, their toxicology, pathology and treatment are fully discussed, and the actual details of illustrative cases are given. At the end of each chapter is a résumé of the chief points. At the end of the book is given a summary of the whole work. Finally there is a very complete bibliography of the subject.

A. T. H. M.

CONTRIBUTIONS TO PSYCHIATRY, NEUROLOGY AND SOCIOLOGY. Dedicated to the late Sir Frederick Mott, K.B.E. By J. R. Lord, C.B.E., M.D. London: H. K. Lewis and Co. 1929. Pp. xii + 401. Price 21s.

These papers have been written by colleagues, friends and former pupils of Sir Frederick Mott at the request of the Council of the Royal Medico-Psychological Association. Sir Frederick was to have been President of the eighty-fifth Annual General meeting of the Association in July, 1926, but died in June of that year on his way to take up an appointment in Birmingham. The Council felt that a memorial in stone or bronze would not adequately express their appreciation of Mott's work, and adopted a suggestion of Dr. Golla that those who had been associated with Sir Frederick Mott should be asked to contribute some piece of work inspired by him to a memorial book. A circular in English and French was sent by the Association to all his friends and associates, and this volume, edited by Dr. J. R. Lord and supervised by a Memorial Committee, is the result.

Dr. Lord contributes a short biographical notice, and Professor Halliburton gives some delightful recollections of his intimate association with Mott. When Mott started his medical career at University College there was at the medical school a band of young men who in later years achieved great distinction. Among his contemporaries were Victor Horsley, Sidney Martin, Montague Murray, Paul Moline and Dawson Williams.

Mott had musical tastes and was a favoured contributor at the musical evenings held in the board room of the old hospital. He also took a prominent part at the meetings of the Students' Medical Society. He was a ready speaker and enlivened his speeches with many an apt quotation.

As a student Mott worked in the physiological laboratory under Burdon Sanderson and Schäfer, and later started research work, dealing with the physiology of the nervous system. After his student days he became first a physiologist and held posts under Professor Caton at Liverpool, and at Charing Cross Hospital. Later he became physician at Charing Cross

Hospital, and throughout his life he remained a general physician as well as a pathologist. It was not until he was appointed Pathologist to the London County Council and head of the laboratory at Claybury, and then at the Maudsley Hospital, that his name became associated with neurology and psychiatry.

The diversity of the topics discussed in the memorial volume indicates the breadth of Mott's activities and the extent to which medical science is indebted to him.

Mott was particularly interested in the early treatment of mental disorders, and this is well recognized by Sir Hubert Bond, who begins his article on the prevention and early treatment of mental disorder by a quotation from an article by Mott: "Every effort should therefore be made to induce the patient, the friends and the practitioner to seek skilled advice or treatment with as little delay as possible. This can only occur if the fear of certification and the fear of being sent to an asylum be removed, and by the provision of greatly increased facilities for early treatment n clinics attached to the general hospitals, or suitable hospitals affiliated with the general hospitals."

To Mott's unremitting efforts the success of the Maudsley Hospital—the first psychiatric clinic on a large scale in this country—was mainly due.

Dr. Helen Boyle, in her article on the provision of early treatment for nervous and borderland patients, writes: "Sir Frederick Mott's illustrious name is at once brought to mind when one thinks of the early treatment of nervous and mental disease. He encouraged all efforts in this direction, and stood by the Lady Chichester Hospital for early nervous and borderland patients in the struggles of its youth both by sending patients to it and by supporting it in public, and by many kindly words in private."

There are thirty-one papers in the memorial volume dealing with physiological, pathological and psychiatrical subjects. The last paper is written by Professor C. Von Monakow, of Zurich, on "Sir Frederick Mott: His Life and Work." The eminent Swiss neurologist says that Mott was equally eminent as physician, investigator and man. His reputation stood high in the scientific circles of foreign countries, as well as of his own. In the field of brain research his achievements were particularly remarkable. To depict Mott's scientific work and to estimate his worth correctly would require a chapter of the history of neurology and psychiatry, if not of general medicine. Dr. Von Monakow concludes his paper with an impressive tribute. "Sir Frederick Mott," he writes, "was not only a distinguished neurologist and physician. He was also refined, noble and modest, and a kind and lovable colleague. Wherever he worked, and with whomsoever he came in contact, he won admirers and friends. To those whom he honoured with his more intimate friendship, he remained faithful and cordial to the end of his life."

We congratulate the editor and committee on the success of their labours. The production of such a valuable memorial volume must be a source of great satisfaction to them.

THERAPY OF PERSONAL INFLUENCE. By Edwin Hopewell-Ash, M.D. Published privately. Pp. 96. BM/ELHA, London, W.C. 1. Post free 2s. 9d.

This small volume of ninety-six pages, bearing the subtitle of "An ABC of Treatment by Personal Influence, Suggestion, Medical Hypnosis and Psychomagnetic Methods," has been written to draw the attention of medical practitioners to a method of treatment that is fascinating in its study and valuable in its results.

Dr. Hopewell-Ash has practised this branch of treatment for the past twenty-five years, so that he speaks with wisdom of ripe experience, yet with undulled enthusiasm.

A large proportion of the work consists of short descriptions of a number of cases treated by the author. The success obtained in such a diversity of conditions as those enumerated excites our admiration and, perhaps, envy.

The author describes briefly the method he employs and emphasizes the importance of the personality of the practitioner, a factor of more consideration than the method used, in the success or otherwise of suggestion treatment. Medical hypnosis he believes in only so far as it induces a state of increased receptivity to treatment.

An interesting little book, worth reading and thinking over.

1915 CAMPAIGN IN FRANCE: THE BATTLES OF AUBERS RIDGE, FESTUBERT AND LOOS. *Considered in relation to the* FIELD SERVICE REGULATIONS. By A. Kearsey, D.S.O., O.B.E., *p.s.c.* Late Lieutenant-Colonel, General Staff. Aldershot: Gale and Polden. 1929. Pp. 88. 4 sketches. Price 3s.

This little treatise belongs to a numerous and useful, albeit lowly, class of books with which medical students are painfully familiar: the *multum in parvo* or "cram" class.

One thing, at least, may be said in favour of books of this kind: they seldom pretend to point a short road to knowledge: they usually admit, quite frankly and honestly, that their purpose is that of assisting candidates to pass examinations; and, so long as the examination system is in vogue, "cram" books will remain with us—an extra-mural part of the system.

In this particular case it would be exceedingly difficult to construct a short road to knowledge. For certain special reasons I had to make a detailed study of the Official History of the War; vol. iv: Military Operations, France and Belgium, 1915. The task occupied three and a half months of good, solid work. Lieutenant-Colonel Kearsey says of his book that "This is only a summary of what readers will find poignantly interesting in vol. iv, Military Operations." Although Lieutenant-Colonel Kearsey's book is as clear as it is concise, I am bound to confess that, had I not studied vol. iv beforehand, I should have found this summary hard to swallow, painful to digest and difficult to assimilate.

Hence my advice to examinees: Firstly, read vol. iv; and secondly, collect, collate and summarize the results of your reading by a study of this short treatise. If I have judged rightly, Lieutenant-Colonel Kearsey would be the first to endorse this piece of advice.

Each battle is preceded by an Appreciation. The three Appreciations are very well arranged and expressed; and their breadth of vision would surprise those whose horizons are confined within the limits of party politics.

An analysis of the descriptions of the battles shows that the author has chosen thus:—

	Number of Instances in which the Principles of F.S.R. were	
	Complied with	Not complied with
Aubers Ridge	3	10
Festubert	8	10
Loos	13	18

In addition, instances are given in which the enemy was successful by reason of his compliance with F.S.R. The whole forms a sound lesson on the practical interpretation of the British Army's active service gospel.

There is a useful Diary of Events, and a carefully compiled Index.

Paper and print are good; but the binding might have been better: loose leaves are just as annoying as lost collar-studs. A.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

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Journal

of the

Royal Army Medical Corps.

Original Communications.

INJURIES TO BLOOD-VESSELS AND THEIR SEQUELÆ.[1]

BY COLONEL G. DE LA COUR, O.B.E., M.B.,

AND

SURGEON COMMANDER H. E. R. STEPHENS, O.B.E., M.B., F.R.C.S., R.N.

BEFORE entering upon a discussion of the technical details of this subject we may, with advantage, look back on some pages of history so that a true perspective may show us the course of events which have prepared the way for our present knowledge. Let us remember for one moment the names of those surgeons who worked in comparative darkness, when the light of surgical truth had been barely kindled.

First let us picture Ambroise Paré, setting out for his campaign in Italy in 1538, as surgeon to Colonel-General of Infantry, René de Montigean. This was the age when boiling oil was poured into the wounds to check the hæmorrhage; when the supply of oil failed, as it frequently did, the wounds were seared with the red-hot iron. Like all great surgeons, Ambroise Paré first observed and then acted. He at once noticed that the wounded who were treated by the surgeons suffered more than those who were left alone. Translating his observations into actions, he refused to employ the red-hot iron as a cautery, and became the first surgeon to place a ligature on arteries and veins. The instruments which he invented for military warfare—such as the swan's beak speculum for exploring the track of a missile—are in their main principles similar to some we use at present. Ambroise Paré may therefore be looked upon as the first surgeon who treated gunshot wounds with any real success.

[1] Paper read before the Fifth International Congress of Military Medicine and Pharmacy.

After Harvey's discovery of the circulation of the blood in 1628, many left their mark on this branch of surgery whom we may briefly mention. Valsalva, who recommended the plan of starvation for treating aneurysm; Morel, who invented the tourniquet at the siege of Besançon in 1674; Jean Baptiste Denis, physician to Louis XIV, who performed the first transfusion of blood in a man who was dying from excessive venesection.

Passing to the eighteenth century, we note Petit, the inventor of the screw tourniquet; Brasdor, who advised distal ligature for aneurysm; and John Hunter, who laid those solid foundations on which the whole of surgical pathology is built. During this epoch brilliant advances were made in allied sciences such as anatomy, physiology, chemistry and physics. Surgeons for ever owe a debt to these, since, by correlating and co-operating with them, Lord Lister evolved the doctrine of antiseptic surgery. However, we should not forget the illustrious surgeon-in-chief to the Grand Army of Napoleon I, Larray. Present in sixty great battles, four hundred engagements, and twice wounded himself, he was perhaps the most renowned military surgeon in history. We pass on to Nélaton, surgeon to the Emperor Napoleon III, who, with his ingenious probe, tipped with porcelain, discovered the bullet in the foot of Garibaldi. Finally, in this brief review, we would remind you of that brilliant and famous surgeon, Langenbeck.

Coming down to the present day, we gratefully acknowledge the work of all those in the War of 1914-18 who have contributed to our knowledge of injuries of blood-vessels and their sequelæ. Particularly in this connection we are indebted to Sir George Makins, on whose writings and observations this paper is largely based.

At the outset we offer no apology for the somewhat dogmatic statements which will appear in the course of this paper, because it is manifestly impracticable to bring every aspect and each divergent view before you within the limit of twenty minutes. Nevertheless, we can assure you that most of the methods set forth have been hall-marked by the stamp of active service practice. As such they are justly entitled to respect, if not agreement. For the sake of simplicity the subject-matter will be discussed according to the following classification:—

(1) General considerations.
(2) Localized contusions.
(3) Wounds of arteries:—
  (*a*) Lateral.
  (*b*) Traversing perforations.
  (*c*) Complete severance.
(4) Wounds of veins.
(5) Repair of wounded vessels.
(6) Sequelæ of wounds of blood-vessels:—
  (*a*) Hæmorrhage.
  (*b*) Damage to the parts supplied by the injured vessel.
  (*c*) Traumatic aneurysm.

(7) Methods of treating injured blood-vessels.
(8) Treatment of aneurysms generally.
(9) Treatment of special arteries.

(1) General Considerations.—It is generally accepted that injuries to blood-vessels differ in no essential particulars from those of the soft parts in other regions. Two factors, however, bring exceptional difficulties in the way of surgical interference. The first is their relative small size, while the second is the constancy of their vital function. The former denotes a delicate structure with but a small reserve of vitality. For this reason repair by suture is frequently rendered difficult or unsatisfactory. The latter factor is an important point which cannot be over-estimated. Here we may be permitted to observe that surgeons as a class have been—in the past, at any rate—far too ready to consider problems of this nature purely from an anatomical aspect, with too little regard for the physiological view. Unless an injured blood-vessel can be restored to duty or even "light duty," a surgeon works in vain. To a very large extent we estimate the worth of any blood-vessel by its capacity for carrying out its work. Consequently in all the sequelæ which may follow injury to an artery, for instance, the severity of the lesion is assessed by the resulting damage to the peripheral parts supplied by that vessel. In the same manner, diseases such as arteriosclerosis or Raynaud's, illustrate only too well how loss of or diminution of function determines the gravity of the case. By applying such general observations to surgical practice in this particular sphere we are enabled to make more accurate diagnoses and formulate lines of treatment with greater hopes of success.

(2) Localized Contusions.—These particular forms of injury to the vessels are more frequently observed in military rather than civil practice. In the latter, arteriosclerosis is more common than in the former. These injuries are usually followed by early spontaneous thrombosis; and such lesions are often overlooked and consequently not recorded owing to obliteration of the lumen. The actual area of the lesion invariably extends to a far greater degree than ocular inspection would suggest. This fact forms their leading characteristic clinically.

Their practical significance is great, as will be gathered from the following examples of the sequelæ :—

(*a*) In the slightest grades, the clot forms at the site of the ruptured intima. This thrombus may be the source of emboli, although only a lateral thrombus, not obstructing the entire lumen, be present. Generally the small clot becomes rapidly covered by endothelium from the adjacent intima.

(*b*) Although the lesion may heal spontaneously, a weak point is left in the wall, which is liable to distension at a later date. This is particularly true when the muscular coat is torn as well as the intima.

(*c*) In infected wounds, the presence of a contused or partly lacerated

vessel is the most frequent source of secondary hæmorrhage. Such a sequel is, of course, due to diminished local resistance to infection in a delicate structure. At the time of the injury this contusion often passes unrecognized on account of the absence of physical signs.

(*d*) In either infected or non-infected wounds, if the contusion has been sufficient to destroy the vitality of the tissues of the vessel itself, traumatic aneurysm may develop subsequently. The slender construction of the vessel walls with their minute blood-supply, referred to in the previous paragraph, only emphasizes how prone this liability becomes.

(*e*) Thrombosis, either partial or complete, will produce a permanent lowering of the nutrition to the tissues supplied by the vessel. Muscle anæmia or anæmic gangrene, according to the degree of thrombosis, follows. In this case the lesion at the periphery depends entirely on the failure in function of an artery situated centrally.

Before discussing wounds of the arteries, it is well to bear in mind three salient features. Thus :—

(i) The associated contusion may have lowered the vitality of the margins of the wound of the artery to a degree which ocular inspection and even digital palpation cannot determine.

(ii) Such injury may be very extensive within the vessel.

(iii) The intima may not only have suffered by contusion, but, as a result of stretching by displacement, it may be fissured at a considerable distance from the wound itself.

(3) WOUNDS OF ARTERIES :—

(*a*) Lateral.
(*b*) Traversing perforations.
(*c*) Complete severance.

(*a*) *Lateral.*—These are transverse, oblique or longitudinal, according to their relation to the long axis of the vessel.

The least important are those minute perforations which are produced by small fragments of metal from an exploded shell. Although these often heal spontaneously, it is remarkable how small an opening occasionally remains patent. Here we note the manner in which the constant function of the artery interferes with the process of repair. Other tissues demand rest for their complete and rapid recovery, but an artery must, of necessity, remain at work.

From the surgical aspect the most satisfactory results are obtained from limited longitudinal fissures, where the coats have been "split" rather than torn. These may often be repaired by suture without material diminution of the lumen of the vessel.

Transverse wounds of the arteries gape widely when more than a quarter of the calibre is involved, and when more than half the wall is

torn a change of axis of the vessel takes place. Such an event greatly favours hæmorrhage, especially as the advantages of complete retraction are prevented by the remaining undivided part of the arterial wall.

(*b*) *Traversing Perforations.*—In these injuries both aspects of the vessel are wounded. It is remarkable that vessels, much smaller in calibre than the bullet itself, may exhibit this class of injury, which is an excellent illustration of lateral displacement produced by a rapidly travelling bullet.

(*c*) *Complete Severance.*—These are very common in vessels incapable of much displacement, or when they are struck in a state of comparative tension, as when the surrounding muscles are taut.

(4) WOUNDS OF VEINS.—These differ from wounds of the arteries mainly in consequence of the comparative tenuity of their walls and the small amount of muscular tissue between the intima and adventitia. Owing to the relatively slow rate of the blood-stream, thrombosis is much more common. When lacerated or severed by irregular masses of metal, the wall of a vein may become frayed out into long strips.

At this point we may turn for one moment from purely military surgery to illustrate a functional disturbance caused by injury to veins by quoting an example from one of our own patients.

The man was admitted to hospital with a fracture of the penis. The usual history of a transverse movement having occurred during coitus was clearly given. Incidentally, this is the only condition under which such an unfortunate accident can occur. On examination, the subcutaneous tissues of the whole of the penis and scrotum were discoloured, except where the pink glans was noted beneath the purple prepuce. On the left side of the body of the penis, about half-way, was a large swelling, the size of a walnut. Expectant treatment was adopted, and the extravasated blood was rapidly absorbed; the swelling, however, remained. After a week the mental condition of the patient entirely changed. Instead of being cheerful, he became sullen and morose. This was accounted for by the patient becoming aware that the penis had lost its function. The proximal three inches became erect, but the distal half beyond the swelling failed. In spite of the doubtful prognosis, removal of the hæmatoma by surgical intervention was undertaken. During the operation it was observed that the tunica albuginea of the left corpus cavernosum had been torn, with consequent extravasation of blood into the subcutaneous tissues. A large thrombus was lifted out of the cavity in the cavernous plexus, where a small artery in one of the torn trabeculæ was bleeding profusely. An arteriovenous aneurysm was in the process of formation. The patient made a complete recovery, with the physiological powers of the penis undiminished. Such an extreme instance serves to emphasize the importance of considering function in the surgical treatment of injured veins.

(5) REPAIR OF WOUNDED VESSELS.—Completely divided vessels may

heal spontaneously as those closed by ligature. Perforations and small lateral wounds, even of great arteries such as the aorta, may also heal spontaneously. In such cases the initial tear becomes sealed by clot, while the inner aspect of this is protected from the force of the blood-stream by the formation of a provisional thrombus. In a very short time the endothelium from the intima covers the latter.

When the openings gape, their edges become regular in outline; the intima and adventitia blend together owing to atrophy of the muscular coat. Thus an arterial fistula is formed, which commonly communicates with a traumatic aneurysm. Spontaneous closure of such apertures may take place by the lateral adhesion of neighbouring structures, especially veins or nerves taking a parallel course.

Severe contusion or incomplete laceration of the walls of the vessels is followed by spontaneous thrombosis. In these circumstances the lumen of the vessel is permanently occluded.

A sharp distinction is drawn between such thrombi and those which are attached to a small and localized injury. The latter form no intimate connection with the vessel wall except at the point actually damaged; they contract, allow the flow of blood to resume, and finally may be completely absorbed.

(6) Sequelæ to Wounds of Blood-Vessels :—

(*a*) Hæmorrhage.
(*b*) Damage to the parts supplied by the injured vessel.
(*c*) Traumatic aneurysm.

(*a*) *Hæmorrhage.*—The signs of both primary and secondary hæmorrhage, being so well known, need not be mentioned here, so the treatment of each will only be described. However, before discussing these, it seems desirable to add a note on the temporary control of hæmorrhage from wounded arteries. Mechanical pressure by an adjacent piece of metal is common, and this explains many cases of recurring primary hæmorrhage. This factor may also be responsible for some cases of secondary hæmorrhage, should the wound become infected. Complete obstruction by missiles, which, after entering the heart or a large vessel, move onwards in the circulation to form metallic emboli at the classical sites is not rare. These emboli become covered with clot, and typical signs of local obstruction develop.

Treatment of Primary Hæmorrhage.

Local.—Bleeding vessels in an open wound are always ligatured at the earliest possible moment. Possible exceptions to this general rule may be made when the deep vessels in the palm of the hand, the sole of the foot or the root of the neck are involved.

When injured vessels, especially those of large calibre, are visible in open wounds, they are ligatured whether bleeding or not. If, however, a large vessel exposed in an open wound has obviously suffered contusion

and is thrombosed, a ligature is placed above and below the thrombosed segment, and the latter is excised. This method removes any danger of secondary hæmorrhage, which is impossible to foretell from inspection alone.

When evidence exists that a large vessel has been wounded in the course of a track traversing the body or limbs, unless the conditions are favourable, it is not advisable to interfere primarily if no signs of hæmorrhage are forthcoming, or if there are no indications that the vitality of the distal portion of the limb is becoming endangered. In all such cases, although an arterial hæmatoma, and subsequently a false traumatic aneurysm, may result, the later treatment of either of these conditions under favourable circumstances is to be preferred to the risks attendant on a primary operation near the front line.

General.—In sudden and abundant primary hæmorrhage immediate transfusion of blood is indicated. Time is the all-important factor in these cases. "The sooner the better" can be applied very truthfully. In less severe cases Bayliss' gum arabic solution may be tried; but, if no permanent effect be produced, it should be followed by transfusion. In milder cases an attempt is made to restore the blood-volume by the administration of large amounts of fluid by the mouth, rectum or subcutaneously. If necessary, transfusion may be expedient.

Treatment of Secondary Hæmorrhage.

Local.—Direct ligature of the bleeding point is by far the most satisfactory practice. Proximal ligature, with the exception of the internal iliac artery, has been proved to be unreliable and therefore dangerous. The administration of hæmostatic drugs cannot be recommended. On the other hand, forci-pressure and plugging are both useful where direct ligature is impracticable; but these may be considered as the last resort of the surgeon.

General.—In these cases the hæmoglobin content is most likely to be already depressed to the critical point. Consequently even a moderate loss of blood will reduce the hæmoglobin content to a figure incompatible with an efficient natural recovery; hence immediate transfusion of blood provides the safest course. Here it is advisable to add a warning note that the beneficial effect expected from transfusion is greatly diminished in patients who are the subjects of a systemic infection.

(*b*) *Damage to the Parts Supplied by the Injured Vessel.*—Short of death of the patient from hæmorrhage, deficiency of the amount of blood furnished by a wounded vessel to the peripheral circulation leads to varying degrees of loss of volume of the part affected, to lowered nutrition of the tissues supplied, or even to actual gangrene. These defective functions of the vessel depend upon certain well-defined contingencies. For instance, clots of extravasated blood may exert local pressure on the vessels in their neighbourhood; or rapid spontaneous thrombosis may cause sudden

obliteration of the lumen. Again, application of a ligature or subsequent narrowing of the vessel, with perhaps thrombosis, occurring during the process of cicatrization, may produce effects noticed in the peripheral parts.

The most fortunate of severe cases are those in which one of the forms of traumatic aneurysm develops, because time is then given for some readjustment of the collateral circulation before the need for surgical intervention becomes acute.

The structures in the limbs which suffer most severely from primary anæmia are the muscles. They retain their normal outline, but increase in firmness in consequence of their assuming a fictitious tone. The latter is produced by rapid nutritional changes, together with an exudation of tissue fluids into their sheaths. The muscles may recover to a varying degree, but in some cases a progressive change continues until a state corresponding to Volkman's ischæmia is reached. Rapid wasting of the limbs is rare after a wound of the vessel, except in those cases where a general systemic infection from a wound of the soft parts is associated with such a lesion.

Should a vessel suffer obliteration, a certain loss of volume is constant, however good the actual functional result may be. The peripheral blood-pressure in the limb is lowered from ten to twenty millimetres of mercury, and the peripheral pulse never regains its former strength and volume.

Some idea of the frequency with which gangrene follows injuries to large arteries may be gathered from a series of 992 cases in which gangrene of a varying extent occurred in no less than 178, or 17·9 per cent. This liability to gangrene varies in different vessels. In the series under review the following statistics are valuable in showing this liability :—

	Per cent.
Common iliac	100
Popliteal	34·7
Carotid	29·6
Femoral	20·2
Subclavian	8·8
Brachial	4·0
Axillary	2·7

Although these figures compare unfavourably with the six to twelve per cent given in textbooks as following ligature of large arteries, it should be remembered that the former, during war time, were often complicated by large lacerated and infected wounds, injuries to large nerves, or fractures of bones.

Many conditions, all common in military practice, predispose to gangrene. For the sake of brevity they may be enumerated seriatim thus: Great decrease in the total volume of blood, due to hæmorrhage; exposure to cold and exhaustion; prolonged retention of a tourniquet, especially popliteal; infection of the wound, general systemic infection and secondary hæmorrhage; associated injury to nerves, especially median and internal popliteal; extent and severity of associated injury to bones or soft parts.

The treatment of gangrene differs in no particular from the lines of procedure followed in civil practice.

(c) *Traumatic Aneurysms.*—Among 1,004 injuries to the great arterial trunks some form of aneurysm occurred in 545 cases, or 54·4 per cent. Observation of a large number of these during the late war showed that the cavity of a traumatic aneurysm rarely represented the loss of blood which resulted primarily from the wound of the vessel. The extravasated blood coagulates, the wound in the vessel wall is closed by clot which, in turn, is supported internally by a thrombus. Such a condition may lead to a spontaneous cure.

More commonly the supporting internal clot shrinks, and thus the opening in the vessel wall is exposed to the full force of blood-pressure from within. In this manner a cavity is hammered out gradually in the centre of the mass of external clot. Concentric layers of fibrin are deposited on the inner aspect of the wall of the new cavity; until finally this becomes covered by an endothelial lining. Meanwhile the original external clot shrinks, becomes differentiated from the surrounding tissues, and forms the basis upon which a definite sac of fibrous tissue is built.

The mode of formation of the sac in arteriovenous aneurysms simulates the above, the sac being developed, with one exception, in connection with the artery. Now artery and vein may communicate with each other in at least eight different ways, according to the position of the sac. Thus :—

- (i) Simple arteriovenous anastomosis.
- (ii) Sac between artery and vein.
- (iii) Sac on one side of artery and direct anastomosis of artery and vein on opposite aspect.
- (iv) Similar to above, but second sac between artery and vein.
- (v) Sac with artery and vein communicating by a common opening.
- (vi) Sac with artery and vein communicating by separate openings.
- (vii) Sac springing from free side of artery and second sac from free side of vein.
- (viii) Sac springing from artery with which the proximal end of a completely divided vein communicates.

From a practical as well as a military point of view, considerable differences in the immediate importance of the arterial and arteriovenous forms of traumatic aneurysm exist.

The arterial is by far the more serious; because it tends to increase in size more rapidly, and it is more liable to burst on account of the greater internal pressure to which its walls are subjected. Danger from rupture is most likely to occur in the hæmatoma stage, when the boundaries of the sac are still in a state of imperfect development. During this phase a movement of the surrounding muscles, such as extension of the limb, may be sufficient to tear the thin margin of the developing sac from the wound in the wall of the artery. Secondary hæmorrhage takes place in conse-

quence, resulting in either external bleeding or rapid extension of the hæmatoma.

The risk of secondary hæmorrhage, in the event of infection, is greatly increased. As a result of the tendency of arterial aneurysms to extend and rapidly increase, signs of pressure either on the vascular trunks themselves or on neighbouring structures much more frequently call for surgical interference than in the case of arteriovenous aneurysms.

The arteriovenous aneurysms are not only less prone to increase rapidly, but they even tend to become localized and diminish in size owing to the vein acting as a safety valve which decreases the full force of the blood-pressure on the walls of the sac.

Owing to their mode of development, the incorporation of important structures in the wall of traumatic aneurysmal sacs is comparatively common, nerves especially being liable to become involved in the same injury.

(7) Methods of Treating Injured Blood-Vessels.—Reference has already been made to the treatment of hæmorrhage, but now certain definite lines of procedure, proved by experience in the late war, will be formulated.

At the Inter-Allied Surgical Conference, held in 1917, it was concluded that, contrary to the precepts accepted hitherto, simultaneous ligature of both artery and vein when both vessels are wounded does not give rise to increased risks of gangrene. In point of fact, the risk of gangrene is diminished thereby. Facts tend to prove, even when the wound is limited to the artery, that simultaneous ligature of the vein is to be recommended.

In certain situations, more particularly the thigh, when primary hæmorrhage has been free, a temporary conduit to maintain the circulation has been employed with some success. Tuffier, whose work in this and many other spheres compels our admiration, designed a silver tube for this purpose. This tube, after being coated with paraffin, is tied into the divided ends of the vessel and left in this position for three or four days. Although occlusion invariably takes place, valuable time has been given for the development of the collateral circulation. Many cases have been saved from the onset of anæmic gangrene by this device.

Suture of blood-vessels is, however, the only method by which ideal results can be obtained. Unfortunately this procedure can only be undertaken in the primary stage when there is reasonable hope of maintaining the wounds free from infection. Here as in many other regions of the body, absolute asepsis forms the keystone in the arch of fautless surgery. As a general rule, intermediate operations are not advised between the second and tenth days.

In performing suture of the vessels the following maxims are set forth as a guide towards perfecting the special surgical technique required. These have been proved to possess a very high and practical value :—

(i) Lateral wounds involving not more than one-third of the calibre of the vessel are most suitable for suture. If more than one-third of the calibre is injured, then an end-to-end union is attempted after resection of the damaged segment.
(ii) Reconstruction of a vessel by employing flaps from the adventitious sac of an aneurysm is not advised.
(iii) Very fine needles with Japanese silk—size 0000—which has been coated with paraffin will enable the best results to be obtained.
(iv) The most satisfactory arteries for suture are the carotid, the femoral and the popliteal.

(8) TREATMENT OF ANEURYSMS GENERALLY.—In the hæmatoma stage direct ligature on either side of the arterial wound is indicated under the following circumstances:—

(i) Continuous hæmorrhage from the wound.
(ii) Rapid increase in size or diffusion of blood into the surrounding area.
(iii) Obliteration or progressive diminution of the peripheral pulse.
(iv) Onset of gangrene.
(v) Pressure on neighbouring structures such as veins, nerves or viscera.
(vi) Secondary hæmorrhage or signs of extending infection of the limiting structures.

Failing the above, an expectant attitude is preferable at this stage, especially if recent and severe primary hæmorrhage has occurred. The necessary operative measures can rarely be undertaken without further loss of blood, which may be fatal to the limb or even the life of the patient.

In the aneurysmal stage, the treatment may be summarized briefly by quoting specific lines of procedure. Although the details submitted may not receive general acceptance, we venture to hope that general agreement will be reached on the main principles laid down.

Spontaneous consolidation is rare; it occurs most frequently in the case of popliteal aneurysms, but hardly ever in arteriovenous aneurysms.

Direct ligature of the vessels implicated is the method generally applicable to all cases. Proximal ligature is never resorted to, except where circumstances render it unavoidable.

Direct ligature may be combined with excision of the sac. This, however, should be avoided if extensive dissection is required. Injury to collateral branches or neighbouring structures may be caused thereby.

Where practicable, suture of the wounds of the large vessels should always be considered as preferable to any other method. Only the great length of time required and the need for particular technical skill prevent the surgeon attaining an ideal result.

Arterial aneurysms, although they usually show an initial tendency to contract and become localized, invariably enlarge again when the patient

resumes his normal life. All require surgical intervention, which is advised during the quiescent period.

Arteriovenous aneurysms, on the other hand, do not show the same inclination to enlarge; but during an active life the venous obstruction steadily increases. As a general rule operation is advised.

Aneurysmal varices may often be disregarded, especially those in the upper extremity, or in the case of small vessels. When, however, they give rise to pain or serious venous obstruction, suture of the anastomatic opening through the laid-open vein is an easy and effective cure.

(9) TREATMENT OF SPECIAL ARTERIES.—A few remarks on the treatment of aneurysms of special arteries will conclude this paper. While it is recognized that each individual case will be judged on its merits, we consider that the fruits of experience in these relatively uncommon lesions may be of some practical value to those who are called upon to decide what is the best method of procedure.

Carotid Vessels.—Except in cases of emergency, proximal ligature of the common carotid artery is avoided. The risks of secondary hæmorrhage and the occurrence of embolism are very real. In addition, proximal ligature by itself frequently fails to effect a cure. The best treatment is ligature above and below.

In arteriovenous aneurysms, both the common carotid aud the internal jugular vein are ligatured. This is recommended whether the vein be injured or not.

Axillary Vessels.—Ligature of the artery and vein immediately above and below the wound is devoid of danger, and is preferred to ligature of the artery alone. Proximal ligature of either the axillary or the third part of the subclavian may be considered as an emergency operation only.

Gluteal and Sciatic.—It is very advisable to ligature the internal iliac artery on the wounded side first before attempting to find the bleeding point in the buttock. These vessels are very liable to retract into the pelvis, and the patient may die from hæmorrhage before the bleeding ends are secured unless proximal ligature has been performed at the outset.

Femoral Vessels.—The bleeding is controlled by an elastic tourniquet. The divided ends are then tied. A provisional ligature placed on the common femoral has little influence in stopping hæmorrhage from the branches of the profunda. Tuffier's tube has furnished the best results here.

Popliteal Vessels.—Ligature should be direct. After severe primary hæmorrhage, Tuffier's tube may be given a trial. A tourniquet is very dangerous at this point owing to the probability of gangrene.

The after-treatment of ligature of a large artery in a limb calls for almost as much care and attention as the operation itself. Immediately the operation is completed, the limb is wrapped up in warm cotton-wool. Anything which may interfere with the circulation, such as tight bandaging or splints, is rigidly avoided. Warmth in the way of constant heat is

supplied by hot-water bottles or electric lamps placed beneath the bed cradle. It was largely owing to the lack of these precautions that the popliteal received an unenviable name for ligature.

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DYSENTERY IN THE LAHORE MILITARY DISTRICT.

By Major D. T. M. LARGE,

Royal Army Medical Corps.

Prior to the year 1925, dysentery amongst the troops in India was regarded as being almost entirely of amœbic origin; statistics up to that year showed only a very small percentage of cases amongst the troops to be due to bacillary dysentery.

It has long been recognized, on the other hand, that dysentery in certain sections of the civilian community, notably in the population of certain Indian jails, was chiefly of bacillary origin. For example, Cunningham and King, writing in the *Indian Journal of Medical Research* in 1917, described 86·5 per cent of the cases of dysentery in the jails of Eastern Bengal as being of bacillary origin, and only 7·7 per cent as being due to the amœba of dysentery.

That these relative proportions of bacillary and amœbic dysentery were not confined to jail populations was shown later by Cunningham, and again in 1924 by Acton and Knowles, working amongst the civil population in Calcutta.

The work and writings of these officers, however, appear to have had little effect on the bulk of the civilian practitioners throughout India or on the military medical officer.

In the case of the latter, the question has been carefully investigated during the last three years in all parts of India where troops are stationed. Manifold, working in Poona in 1925, proved that the vast majority of dysentery cases amongst the troops there were due to *Bacillus dysenteriæ* Flexner, and that the exceedingly common "Poona-itis" was of the same origin. In 1925, specialists in pathology trained in the R.A.M. College, London, were appointed to the military laboratories in India, and since then it has become apparent that the vast majority of dysentery cases amongst the troops in India are of bacillary origin.

Chart 1 shows how the change has taken place in Lahore district. In 1924, for example, and to some extent in 1925, the total dysentery in the Lahore district was described as almost completely protozoal. A certain amount of dysentery in 1924 (20 per cent) and in 1925 (6 per cent) was said to be clinical and is not shown in Chart 1.

In 1926 and 1927, after the re-organization of the military laboratories, it was found that the position was almost completely reversed. Only about a quarter of the dysentery could be said to be protozoal, as over 76 per cent of it was very definitely bacillary, the causative organism being isolated and proved serologically in the majority of the cases.

The main reasons for this change in the diagnosis of dysentery amongst the troops are :—

(1) It became recognized that specimens from dysentery cases had to be dealt with immediately, and that if they could not be examined and cultured immediately, it was essential to preserve the material for examination so as to keep the organisms from being overgrown. Teague's glycerine and saline fluid was taken into general use for this purpose and proved most valuable.

(2) The use in laboratories of litmus lactose-agar plates and the picking off of some half dozen colonies from each plate, the washing of the mucus in several changes of saline before plating, and in fact the adoption *in toto* of the methods of diagnosis taught by the R.A.M. College.

(3) Medical officers became chary of diagnosing "dead amœbæ" when it was shown that the "dead amœbæ" or "cysts" were in very many cases nothing more than phagocytes or polynuclear pus-cells. Acton and Knowles'

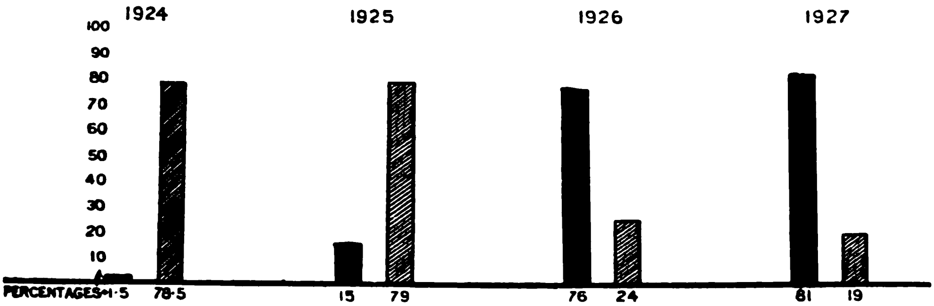

CHART 1.—Black = bacillary dysentery ; striped = protozoal dysentery.

pamphlet on dysentery, supplied to every M.O. in 1925, with its pictures of bacillary and protozoal exudates, pointed out the distinctions clearly and aided greatly in more accurate diagnosis than was possible before then.

SEASONAL INCIDENCE OF DYSENTERY IN LAHORE DISTRICT.

A study of the figures for the total dysentery cases in the Lahore district over a period of four years, 1924—1927, shows that dysentery cases increase markedly in incidence at two periods of the year, just before the hot weather, in March, April and May, and just after it, in September and October. These months are warm, but not as a rule unduly hot, and it is in these months that flies are most prevalent. If the average figures for total dysentery cases over the period of four years be considered as in Chart 2, it will be seen that there are two periods of comparatively low incidence. The first, January to February, coincides with the period when the weather is too cold for flies, and the second, June to July, when there are few flies because, presumably, it is too hot.

Method of Diagnosis.

The work of Manifold and of Acton and Knowles was followed, as closely as possible, throughout the investigation. In all cases a provisional diagnosis was first made as the result of a microscopical examination of the stool, with a view to enabling appropriate treatment of the case to be commenced immediately. The distinctive characters of the bacillary exudate when examined under the microscope are so well known that no description is necessary here.

Taking the results of one laboratory in 1927 as an example, eighty-six cases of definite dysentery were examined. Of these seventy-four, or

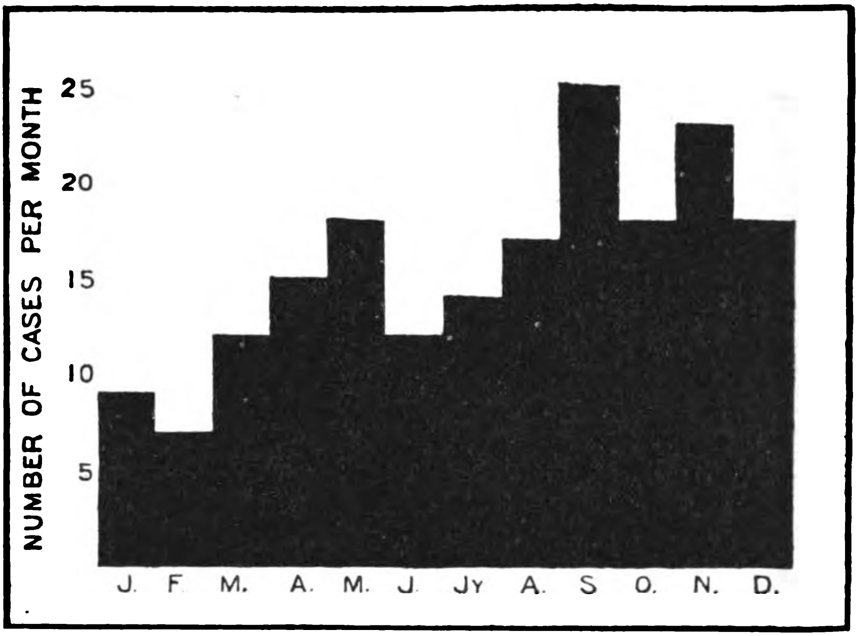

Chart 2.—Chart showing average number of dysentery cases per month during the four years 1924-27.

eighty-six per cent, showed the typical bacillary exudate consisting almost entirely of leucocytes and pus-cells, the remaining fourteen per cent showing nothing very characteristic, unless, as in seven cases, the *Amœba histolytica* was found. In this laboratory the percentage of bacillary cases is slightly larger than that shown in Chart 1, which includes the results of several laboratories.

From the cases classed on microscopical examination of the exudate as bacillary, the causative organism was isolated in 69·1 per cent. The large number of bacillary cases in which the organism could not be isolated (30·9 per cent) is due to the fact that a large number of specimens examined

in this laboratory come by post from out-stations, preserved in 33 per cent glycerine saline, and some do not arrive until they are two or three days old. In all such cases, a provisional diagnosis is made on examination of a dried film of mucus and the result of this posted immediately to the hospital concerned.

Method of Culture.

A small piece of mucus washed in saline was placed on litmus lactose-agar. Next day a number of colonies were picked off and inoculated into lactose, one or two of the most likely being put into glucose and mannite at the same time. In this way a diagnosis as to whether the organism was of the Flexner or Shiga-Schmitz group could usually be given on the biochemical reactions and morphological appearances, on the third day after receipt of the specimen. The necessity of picking off and testing four or five organisms from each plate was often demonstrated, for on occasions perhaps three colonies turned out to be *B. asiaticus*, while only one or two gave the typical sugar reactions of B. Flexner, etc.

Types of Dysentery Organisms.

The organisms isolated from bacillary cases during the period were divided on their biochemical reactions into three main groups, the Flexner group (74·1 per cent), the Shiga or Schmitz group (12·6 per cent) and the lactose fermenting group (13·3 per cent).

The main object of the investigation was to differentiate the Flexner group into its various sub-groups, which was done serologically as follows:—

Serological Tests.—High titre sera were produced in the usual way from rabbits inoculated with varying doses of B. Flexner, V, W, X, Y and Z, obtained from the R.A.M. College, London. All these sera were preserved by the addition of glycerine twenty-five per cent to fifty per cent according to the titre obtained.

Cultures of each organism in Lemco broth, killed by 0·1 per cent formalin, were then tested by Dreyer's agglutination method against each of the high titre sera. Preliminary tests showed that the four hours' incubation advocated in the textbooks did not produce anything like the highest figure of agglutination possible. This was therefore lengthened to eight hours, then to sixteen and finally, for ease of working, the tubes were left in the water bath at 56° C. overnight, receiving about twenty hours' incubation.

Tests of each unknown organism were on each occasion accompanied by a test of the known organism, i.e., the exact titre of the serum was estimated on each occasion an untyped organism was tested. This was found to be necessary, as if the laboratory is left unoccupied overnight there is a possibility that the incubator lamp may go out and the incubation period may be shortened. The agglutination figures shown hereafter as percentages of full titre are therefore strictly comparable with each other.

Each unknown organism tested was subcultured daily at least ten times before testing.

Taking the results of testing one serum against its own and the other organisms of the Flexner group as an example, the effect of prolonging the incubation from eight to sixteen hours is shown in Table I.

TABLE I.

Serum	Organisms	8 hours' incubation		16 hours' incubation	
Type	Type	Fraction of full titre	Percentage of full titre	Fraction of full titre	Percentage of full titre
V	W	125/2,500	5	250/5,000	5
V	X	250/2,500	10	500/5,000	10
V	Y	1,000/2,500	40	1,000/5,000	20
V	Z	125/2,500	5	250/5,000	5

Note.—The denominator of the fraction in this table shows in each case the result of testing "V" organism against "V" serum, and represents the highest dilution in which agglutination was obtained. The numerator indicates similarly the result of testing other organisms of the group against "V" serum. The resulting fraction is expressed in the next column as a percentage of full titre.

It will be noted that *B. dysenteriæ* Flexner Y agglutinates with the "V" serum to 40 per cent of titre after eight hours' incubation, but to only 20 per cent on incubation for sixteen hours. Exactly similar instances occurred when testing other stock organisms against the stock serum, e.g., *B. dysenteriæ* Flexner X against "W" serum agglutinated to 25 per cent of full titre after eight hours' incubation, and to only 10 per cent on sixteen hours at 56° C. (not shown in table). One gathers from this that the time necessary for development of full agglutination varies with each organism. This is well shown in Table I where, in the test of serum V against Y organism, the Y organism agglutinated to its full extent (1 in 1,000) in eight hours, but the V organism took sixteen hours to agglutinate fully (showing 1 in 2,500 at eight hours, and 1 in 5,000 at sixteen hours).

Many tests showed that no further agglutination occurred after more than sixteen hours' incubation.

During the period occupied by the inquiry, 100 organisms of the Flexner group were collected and examined. These were placed in the following groups as the result of serological tests.

(1)	*B. dysenteriæ* Flexner	.. ..	V	4 per cent
(2)	,, ,, ,,	.. ..	W	36 ,, ,,
(3)	,, ,, ,,	.. ..	X	8 ,, ,,
(4)	,, ,, ,,	.. ..	Y	3 ,, ,,
(5)	,, ,, ,,	.. ..	Z	11 ,, ,,
(6)	,, ,, ,,	.. ..	VZ	4 ,, ,,
(7)	,, ,, ,,	(imperfectly agglutinable type)		34 ,, ,,

Agglutination of the organism to 100 per cent of the titre of the type serum was considered necessary for "typing" purposes.

From this it will be seen that *B. dysenteriæ* Flexner W is the commonest of the Flexner organisms isolated, occurring in this series to the extent of thirty-six per cent. It is to be noted that the sera used for typing this series were all made from organisms obtained from the R.A.M. College, London, and the results are therefore comparable with those published in 1927 by Manifold working in Poona, and Wats and Loganadan in Secunderabad and also with those of Little in Mhow, who obtained their type cultures from the same source. The results obtained with this Lahore series correspond very closely with those noted in other parts of India and do not differ markedly from those obtained by Wolff working in Deli (Dutch East Indies). Many of the results noted in the series were controlled by agglutinogenesis experiments (*see* later).

The Imperfectly Agglutinable Group.—This group comprised no less than thirty-four per cent of the total number of organisms classified as *B. dysenteriæ* Flexner by their carbohydrate reactions. On first isolation of the organisms, this group appeared to be divisible into two sub-groups.

(*a*) The first sub-group, consisting of sixteen per cent of the total Flexner organisms, could not be said to agree with any of the named types (V, W, X, etc.), for the reason, in the majority of cases, that the organisms did not agglutinate with any of the type sera to a sufficiently high titre. The exact titre of the serum used was estimated on each occasion, and those which did not agglutinate with any of the type sera over fifty per cent of full titre were placed in this group. This group was tested on three occasions, e.g., at the tenth, fifteenth and twentieth subculture, but no significant difference was found in the results. Further work is required on this group.

(*b*) The second sub-group, consisting of eighteen per cent of the series, appeared at first to be completely inagglutinable with any of the known types of Flexner sera. Tests of this group were made on many occasions and for many months no change was found in their characteristics.

From four of them high titre sera were prepared in the usual way and in no case was it possible to obtain a higher titre than 1 in 250, whereas, using the same method, a titre of ten times this amount could easily be obtained with the ordinary Flexner organisms. This agrees with Manifold's finding in Poona. Even this titre fell very rapidly on keeping, so that at the end of a few months it was seldom more than 1 in 50.

Attempts were made to produce a higher titre in three of the cases by

using Susman's method of injecting solution of brain extract subcutaneously, concurrently with the intravenous injections of the organism, but no appreciable difference was found in these cases.

On the other hand, an apparently higher titre could be produced by following Formicola's method of using a culture of the organism in taurocholate broth instead of ordinary broth. Ordinary broth was used in the tests which follow, as sometimes false agglutination occurs with taurocholate broth.

The result of testing three of these sera against their homologous and certain heterologous inagglutinable Flexner organisms is shown in Table II. The organisms used in this test were between three and four months old, and from the result of the test it might be said that three seem to belong to one serological group, e.g., Adjudia Lal, Smith and Sujan Singh, and that two others, Hodder and McLellan, seem to belong to another serological group. On the other hand the inagglutinable B. Dymott, when injected into a rabbit, produced a serum which agglutinated *B. dysenteriæ* Flexner Z to 100 per cent of titre. It would seem therefore that this organism although inagglutinable is really a "Z."

TABLE II.

Organisms	Sera (made by Susman's method)		
	Adjudia Lal	Hodder	Dymott
Adjudia Lal	1 in 125	0	0
Smith	1 in 125	0	0
Hodder	0	1 in 250	0
Dymott..	0	0	1 in 250
McLellan	0	1 in 250	0
Sujan Singh	1 in 250	1 in 25	0
Flexner V	0	0	0
,, W	0	0	0
,, X	0	0	0
,, Y	0	0	1 in 50
,, Z	0	0	1 in 250

Note.—A serum made from strain Smith proved identical with that made from strain Adjudia Lal.

Further work on this sub-group carried out about a year after it was isolated, considerably modified the earlier findings. Of the six organisms quoted above, only two were now completely inagglutinable, Adjudia Lal and Smith, and even these two could be shown by agglutinogenesis tests to belong to the "X" type of *B. dysenteriæ* Flexner. The results obtained on testing these six originally inagglutinable organisms after retention for a year in the laboratory are shown below :—

Organisms	Sera				
	V	W	X	Y	Z
Adjudia Lal ..	0	0	0	0	0
Smith	0	0	0	0	0
Hodder	1 in 50	1 in 50	0	0	0
Dymott	0	0	0	0	1 in 50
McLellan ..	0	1 in 25	0	0	0
Sujan Singh ..	0	0	1 in 250	0	0

Serum made from the year-old organism "Adjudia Lal" now agglutinates B. Flexner X to 10 per cent of full titre, while serum made from the organism "Smith" agglutinates B. Flexner X to 100 per cent of titre. Comparing this with the table above, it will be seen that the three organisms which were thought originally to belong to the same group of "inagglutinables," i.e., Adjudia Lal, Smith and Sujan Singh, really seem to belong to the "X" type of Flexner organism.

Similar results have been obtained with six other originally inagglutinable Flexner strains, which have been more recently isolated, and in the case of two of them the property of agglutinability appeared about three months after isolation.

Certain others, less than three months old, remain completely inagglutinable with any of the Flexner type sera.

It would appear, therefore, that there is no true completely inagglutinable type of Flexner organism and that strains considered to be inagglutinable will, if kept long enough, show a certain and possibly an increasing amount of agglutinability with specific sera.

Similar tests have not been carried out up to the present on the organisms placed above in the first sub-group of imperfectly agglutinable Flexner organisms, but possibly on keeping, these might develop sufficient agglutinability to enable them to be placed in one of the named types of B. Flexner.

From the point of view of the preparation of a prophylactic vaccine, the existence of this imperfectly agglutinable group does not perhaps matter much. More than half of the organisms isolated agglutinate with V, W, X, Y and Z sera to amounts varying between 10 and 50 per cent. It appears probable, therefore, that the remainder, even those found at first completely inagglutinable, will develop sufficient agglutinability or agglutinogenic power to enable them to be placed in one or other of the named groups of Flexner's bacillus.

The Lactose Fermenting Group.—The results of preliminary work on this group have already been submitted for publication in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS under the heading of "Notes on Sonne Dysentery in Lahore District." This work was rendered possible by the

increased monetary allotment now made to military laboratories in India. It attempts to show that some 12 or 13 per cent of the total bacillary dysentery in India is due to *B. sonne*, which appears in India in two forms, an early form, showing circular smooth colonies, and a later development of this form, showing crenated irregularly spreading colonies, which occurs after a varying number of subcultures of the original smooth form. Both forms of colony are agglutinable with a serum made from the first form, while a serum made from the second, crenated form, will agglutinate only this form, and have no effect on the circular smooth form. This is important in view of the fact that the stock cultures maintained in laboratories from which sera are usually made are invariably of the crenated type, while it is becoming increasingly apparent as a result of recent work in this laboratory, that *B. sonne*, on first isolation, assumes the circular smooth form in the majority of cases. This fact perhaps explains the irregularity of agglutination tests found by many recent observers.

Agglutinogenesis Tests.—In order to confirm the results of the agglutination tests carried out in this research, many agglutinogenesis tests have been performed. For example, an organism said to be *B. dysenteriæ* Flexner W as a result of agglutination tests is injected into a rabbit and a high titre serum is produced in the usual way. This serum is then tested against the various bacilli of the Flexner group. If it agglutinates B. Flexner W to the same titre as its homologous organism, and at the same time does not agglutinate other members of the group to a similar titre, it can be said that the identity of the organism as shown by the agglutination test is confirmed by agglutinogenesis. So far, such tests have been carried out only on bacilli which are definitely inagglutinable with the ordinary V, W, X, Y or Z sera, or which show such definite agglutinability with these sera that they were placed in one or other of the named groups of Flexner's bacillus. The results in the case of the definitely agglutinating organisms have been in all cases to confirm the results of the agglutination tests. In the case of "inagglutinables," however, the production of a high titre serum has shown in the three cases so far tested that the agglutination test is not sufficiently reliable to allow the classification of a group of true inagglutinable Flexner organisms. The three sera referred to, which were made from organisms originally inagglutinable, show a certain amount of agglutinating power over various bacilli of the Flexner group. This is confirmed by late agglutination tests which show that two of these organisms, when kept for a year in the laboratory, show some agglutinability with V, W, X, Y and Z sera.

Summary.

(1) Bacillary dysentery in Lahore military district is very much commoner than amœbic, forming some 80 per cent. of the total dysentery.

(2) Dysentery in Lahore district, while present throughout the year, increases markedly in incidence in the warm months prior to the real hot weather and immediately following it.

(3) Bacillary dysentery has been almost invariably very mild in type in the years 1925 to 1927, even in the case of Shiga infections. Some cases of Flexner infection had only one day's diarrhœa with blood and mucus in the stools.

(4) Bacillary dysentery in Lahore district is grouped into that due to *B. dysenteriæ* Flexner 74·1 per cent; *B. dysenteriæ* Sonne 13·3 per cent and *B. dysenteriæ* Shiga or Schmitz 12·6 per cent.

(5) The Flexner infections assume the following proportions:—

(1) *B. dysenteriæ* Flexner	.. .. ..	V	4 per cent
(2) ,, ,, ,,	.. .. ..	W	36 ,,
(3) ,, ,, ,,	.. .. ..	X	8 ,,
(4) ,, ,, ,,	.. .. ..	Y	3 ,,
(5) ,, ,, ,,	.. .. ..	Z	11 ,,
(6) ,, ,, ,,	.. .. ..	VZ	4 ,,
(7) ,, ,, ,,	(imperfectly agglutinable)		34 ,,

(6) Agglutination tests in the case of dysentery require incubation for sixteen hours at 56° C. It was found convenient to leave them overnight in the water-bath.

(7) The diagnosis of Sonne dysentery requires a high titre serum made from a circular smooth colony of this organism, or preferably two sera, one from the circular smooth early form and another from the crenated late form.

(8) An originally large group of inagglutinable Flexner organisms was found on retention for a year in the laboratory to have become agglutinable to a small extent with Flexner sera and then to have become capable of producing a serum which agglutinated various bacilli of the Flexner group, in some cases to high titre.

In conclusion, I beg to thank Major J. A. Manifold, D.S.O., for much inspiration and help during this research.

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RING UP THE CURTAIN !

BY U.P.A.

PROLOGUE.

IN this country Hylton and Payne have more admirers than, say, Puccini or Strauss.

Most of our people prefer to listen to "Get out and get under the Moon" than, for instance, to the love songs of Tristan and Isolde.

The late Marshal Foch said: *learn to think.*

Let us think of what is involved in a rendering of "Get out and get under the Moon."

The first essential is a pseudo-tenor who possesses a thin twanging voice of nasal quality. This quality is popularly supposed to be a necessity. It is not. It is cultivated for the purpose of reaching those higher notes which the pseudo-tenor could never encompass were he to tackle them in the normal way. It is an artificial, if not pathological, method of singing.

The pseudo-tenor makes a great mistake. He imagines that he is a good imitation of Huckleberry Finn's famous nigger, Jim. He may be thankful that Mark Twain died a long time ago.

Next—the saxophone: an excellent instrument in a military band, in which there are forty-nine other, and preferably more powerful, metallic instruments. It was never meant to be dominant—not even in "Get out and get under the Moon."

Finally, the old banjo, beloved by Uncle Remus, immortalized by Kipling. It used to be played, caressingly, by the fingers of the right hand. Nowadays it is banged with a plectrum in a vain attempt to compete with the saxophone, and to conceal the shortcomings of the nosey tenor.

"Are you fond of music?"

"Yes, rather! Last week I saw *Hit the Deck!* It was topping."

"I went to *Iolanthe.*"

"Good gracious! My dear—how could you? How utterly pliocene!"

"Yes, it was rather mouldy. And you, Mr. Smith?"

"Last night I heard *Parsifal.*"

"*Parsi*—what did you say?"

"*Parsifal*: a grand opera by Richard Wagner."

"Highbrow! Help!"

With this opprobrious term, "highbrow," the devotees of negroid melody label the inoffensive Smith. "Harmless, my dear, but very 'superior,' if you know what I mean. Of course he doesn't really understand the technique of the stuff; and as for enjoying it—pooh!"

Nevertheless, yesterday's favourite, the "Dardanelles," is to-morrow's

corpse, while *Don Juan* lives for ever. Even dear old Eugene Stratton will be remembered long after the B.B.C.'s warblers, and their noses, have been laid to rest.

It is often said that a choice between jazz and classical music is largely a matter of taste and temperament. That is only half the story. It is largely a matter of education and opportunity.

In the world of music and the drama, self-education is possible and opportunity may be sought and found; and it is astonishing how education and opportunity will reveal and expand hitherto unsuspected taste and temperament.

If you decide, definitely, to "Get out and get under the Moon," read no more: further perusal will only annoy you.

On the other hand, if you feel sympathetically inclined, if you agree that all the fun of the fair is not centred in Dixie, come with us—albeit we, Georgina and I, are the veriest amateurs, simple, ingenuous and quite untutored in that great branch of Art, Grand Opera.

I.

This operatic quest was undertaken in January and February, 1929, in Germany, Czecho-Slovakia and Austria.

"Buy British" is an admirable slogan—provided it is made practicable: the customer must have the necessary cash, and the trader must be able to deliver the goods when and where they are wanted.

In this country opera cannot be enjoyed on the grand scale except in London: it cannot be found except in the proper season, and it cannot be indulged in except at enormous expense.

It is, first and foremost, a Society affair.

Having secured seats at hair-raising prices, Society dons its most gorgeous gowns, displays its most precious jewels, partakes of the rarest articles of diet, boards its multi-cylindered automobiles and "assists" at the spectacle. The true significance of it all will not be found in *The Times* next morning. In order properly to appreciate the situation you must join the small band of real enthusiasts outside the gallery doors, five or six hours before opening time. Eventually, and in a state of exhaustion, you wedge yourself into a seat in the "gods." Your back forms a convenient foot-rest for the person behind you. An odour of orange peel and eucalyptus almost overcomes the aroma of exquisite perfumes with which the rising, hot air is charged. Away below, the flash of a cluster of diamonds penetrates the gloom—and you realize why Richard Wagner became an advanced social revolutionary. You hope old Wagner's ghost is not floating about in front of the footlights; and you ask your number two if he will kindly remove his feet.

The best directors conduct, the best musicians play, the best vocalists sing. The dresses are of the finest, and the scenery is beautiful. Here and there the ensemble may be a little patchy: the team work is not perfect,

for the cream of the grand opera world comes from all points of the compass. Nevertheless, the results are magnificent: Society is edified, and the "gods" recover their moral in due course.

Thanks to State and municipal aid, things are ordered differently on the Continent. There, too, the cost of production is colossal; but you and I are enabled to hear *The Ring* without counting the cost. We are not bound hand and foot to a choice between the products of Hollywood and professional football. We need not even listen to "Get out and get under the Moon."

Think of it, even if you are not a musical "highbrow."

During the winter of 1929 snow lay on the ground to a depth of from four inches to four feet. The Rhine and the Danube were frozen from bank to bank. A nor'-easter blew so fiercely that movement on foot, out of doors, was a misery or an impossibility. The thermometer registered from 26 F. to 56 F. degrees of frost.

It is unnecessary—it may be even impolitic—to mention these things because, at that time, weather conditions in Great Britain were very much worse; or so our friends informed us on our return. Indeed, so impatient were they to recount their own hardships and discomforts, that our tale was never half told.

Many people find their joys in tribulation and their recompense in sympathy.

Not that we had much to complain of, for we were transported in stuffy trains, lived behind thick walls, double windows and doors, and fanned ourselves in the semi-tropical temperatures of central heating plants. No icy draughts, no lack of coal or of oily foodstuffs, and no burst pipes.

Perhaps our friends at home were right.

The Hook, Sunday, 6 a.m.

We were bundled out of the ship, shepherded across the ice-bound quay and paraded before the passport, customs, and other officials who guard the foreigners' gates.

The train was enveloped in clouds of steam, through which its lighted windows cast a yellow glow on the snowy covering of the wind-swept platform.

Shivering, we clambered aboard, disposed of our packages, discarded our wraps and inhaled many cubic feet of superheated air. It was air redolent of the kitchen, cigars, axle grease and soap: but it was hot.

We had two fellow-passengers, Tannhäuser and Elizabeth.

Tannhäuser was a tubby little man with a round, red face and a bald head. He wore a new blue suiting, fancy socks and tan shoes. A pale lilac shirt and collar framed a bright red and green silk tie. A gold "albert" hung in a graceful curve across the front of his straining waistcoat; and he

sported a massive signet ring. His snore was vibrant, and calculated to reach the topmost seats in the gallery.

Elizabeth was a large lady, fat, fair and forty. She slept all the way to Hanover, but she did not snore. German women, even the formidable kind, would never dare to do anything like that. No encroachment on the male prerogative is permitted in the Fatherland.

The christening of Tannhäuser and Elizabeth was not a matter of empty nomenclature: it was a case of physical type. It would have been equally correct to have called them Walter and Eva, Lohengrin and Elsa or Siegmund and Sieglinda.

Once you have put a Wagnerian character into his proper niche, you have twenty labels from which to choose.

Thus, the heroes, the Tannhäusers and Lohengrins, are all tubby little fellows, deep-chested and bull-necked. Their features are rugged and rubicund. They shave once in forty-eight hours, and have their hair cut once in three months. You know that when their singing days are over they will be accepted by the T.U.C.—Village Blacksmith's Branch—without payment of the usual entrance fee.

Similarly the heroines, the Elizabeths and Elsas, are all alike in appearance, though they are quite unlike the hero class. These ladies are amply proportioned—voluminous, if not fat—and their hair is flaxen and dull, like bleached tow. Perhaps Wagner, during his exile in England, found his model behind the bar in the old Empire in Leicester Square.

Then there are the harassed heavyweights, the Wotans and Amfortases; the languishing Venuses and the athletic Brünnhildes; the sinister Ortruds and Kundrys—all of separate physical types, whether they be seen in Cologne, Frankfort, Wiesbaden or Munich.

So distinctive are these types, and so many representatives of each are to be met with, that one is tempted to inquire if there is a Wagnerian Eugenic Society in Bayreuth which devotes itself to the creation and perpetuation of the sealed pattern Wagnerian strains.

Certainly, science appears to play a part, for Wagner seems to have taken care to base his physical forms on the staple articles of the national dietary. It should not be a difficult job to cultivate the characteristic points—or, rather, curves—on a liberal ration of sausages and beer, in varying proportions; with, in the case of the Ortruds and Kundrys, an extra allowance of sauerkraut.

This is a happy circumstance because, if a rising young singer has been unfortunate at birth and does not conform to physical type, he must mould himself—or be content with minor parts for the remainder of his days. As a last resort he may, of course, turn renegade, and transfer his activities to Verdi or Massenet; but, in Germany, that would be considered very bad form.

The sound of the steward's gong put an end to further speculations on the larders and eugenics of Teutonic opera.

Platefuls of steaming porridge were put before us. Not the ordinary mushy mess floating in watered milk, which goes by the name of porridge; but the genuine Scots article, served with delicious cream. Even Georgina liked it.

We arrived at Hanover at 2 p.m. Elizabeth woke up, collected her goods and chattels, and departed. Her exit made the compartment seem quite empty.

Tannhäuser pulled himself together and said—No: he did not say that he was a sinner and proposed to reform; he said: "I'm 'avin' *mittagessen* in the *speisesall* 'ere. Wot about a stroll in the town? That'll parse the time for you nicely."

I hope he did not notice our astonishment.

Mr. George Bernard Shaw has pointed out that England is full of potential Wagnerian characters who are only awaiting the advent of grand opera to step on the stage, expand and become famous.

We changed the little man's name to "Our Mr. T." During the rest of the journey he was most helpful and informative. We guessed him—"albert" and all—to be a product of Brummagem.

We were just beginning to enjoy Hanover, when a mixture of sleet and snow drove us back to the shelter of the big waiting hall in the station.

By this time we had collected the usual friendly retinue which Britishers who wander in unoccupied territory always attract. In this instance it comprised a pale, myopic youth who wore horn-rimmed goggles and a black plush sombrero. He was anxious to improve his English which, like my German, was in urgent need of improvement. Then there was an old porter (Labour Bn.) who, no doubt, fraternized in front of Ypres at Christmas, 1914. He was greatly distressed on discovering that we could not understand the strange patois which issued from the depths of his walrus moustache. The third attaché was a sturdy fellow with bright blue eyes, a vigorous manner and a loud voice. He spoke French, but he was embarrassingly pro-British. Before we could stop him—in fact, before we realized what was afoot—he was conducting a sort of Marble Arch meeting. We were supporting him on the platform, so to speak, and the audience was delighted. However, as it soon became plain that the Entente was in danger, we beat a speedy retreat.

We left Hanover at 4.30 p.m.

Our Mr. T. bid us farewell at Leipzig, and we arrived in Brunswick at sundown.

The Hotel Deutsches Haus was first-class, and not too expensive. The food was excellent; but, unfortunately, its quality caused us to be over-critical during the remainder of the trip.

Certain German towns, such as Coburg and Hanover, make a special feature of their relationship with England. In the case of Brunswick, the

guidebook informs you that "the history of centuries unites the two"; but whether this denotes genuine pride and satisfaction, or is merely an example of commercialized sentiment, it is impossible to say.

The most famous Brunswicker was Henry the Lion, who married Mathilda, daughter of Henry II of England. In 1166 Henry erected the interesting Brunswick bronze lion, a replica of which stands in the South Kensington Museum. The original faced our bedroom window. It was backed by a fine Romano-Gothic cathedral which contains the tombs of Henry and Mathilda, along with forty-eight coffins of the house of Guelph.

In 1764 the then Prince of Brunswick wedded Augusta, sister of King George III of England. Their daughter, Caroline, became George IV's queen; and their son, Frederick William, the Black Duke, raised the renowned skull-and-crossbones regiment, the Black Brunswickers, which fought under Wellington in the Peninsula and at Waterloo.

Brunswick is a charming town, with many beautiful old buildings and quaint streets. The mediæval Cloth Hall is an artistic gem.

The first performance of Goethe's *Faust* took place in Brunswick in 1829. As our visit occurred in the centenary year, we felt it incumbent on us to attend a performance at the municipal theatre. So on Monday morning we inspected the playbill, and this is what we read:—

Monday: *Charley's Aunt.*
Tuesday: *The Flying Dutchman.*
Wednesday: *The Bat.*

At that time, in Germany, there were two plagues. One was Mr. Edgar Wallace, and the other was *Charley's Aunt.* Except in houses entirely devoted to opera, you met this strangely assorted couple everywhere.

We decided not to encourage *Charley's Aunt.* We considered that she had had a long enough innings and must be past her prime. As a matter of fact, in Germany, she has been rejuvenated in rather a wonderful way. The part has been taken up by a leading actor who is still a young man. He has scored a tremendous hit by appearing in a black silk evening frock. The frock is sleeveless, cut low back and front, well above the knees before, and drooping in a graceful curve behind. Light stockings and black shoes set off a pair of immaculate calves and blameless ankles. Pearl necklace and ear-rings, shingled hair, and a twelve-inch cigarette holder complete a modern, if not orthodox, *Charley's Aunt.*

Nowadays the modernists have it all their own way in Germany. If our Mr. Epstein were to visit Germany—taking his "Night" and "Rima" with him, of course—he would be accorded a triumph such as the Roman emperors never dreamed of. In the oldest and most respectable institutions, where tradition, conservatism and reputation count for much, e.g., the Dresden Opera House, modernism is kept within reasonable bounds.

But everywhere else it creeps in, or bursts out, according to the policies of directors and the tastes of patrons; and it is seldom as innocuous as the new *Charley's Aunt*.

The opera house at Cologne is under go-ahead management. It has produced Offenbach's *Orpheus in the Underworld* in a new setting. The opera is a light fantasy, and the setting conforms. In the first scene the curtain goes up on a landscape: sky, royal blue; hills, rich magenta; grass, emerald green; and in the foreground a yellow ochre field. Neither Georgina nor I was able to decide whether it was a field of standing corn or a field of gigantic bananas. Anyhow, it bore a close resemblance to the hold of a ship outward bound from the West Indies. Offenbach, who died in 1880, set several of his scenes in rural surroundings; but he never dealt in bananas—let alone gigantic bananas. We live in a more enlightened and enterprising age.

(*To be continued.*)

A MEDICAL APPRECIATION.

By Major E. W. WADE, D.S.O.,
Royal Army Medical Corps.

With Comments

By Major H. R. DEANE,
p.s.c., G.S.O.2, Lucknow District.

Recent literature on the subject of appreciations to be submitted by Majors R.A.M.C. for promotion to Lieutenant-Colonel—subhead (h) V—is ever growing larger, and is now assuming formidable proportions.

Several papers on the subject have taken the pattern laid down in T. and M. Regulations, Ch. II, Section 25, as the indispensable basis, and my excuse for this article is my firm belief that this is a mistake.

Most writers agree that the T. and M. Regulations formula is unsuitable to the extent that paras i, ii, iv of Sect. 25, Ch. II, are entirely inapplicable to the medical requirements. Some under "Object" say, "The treatment of the sick and wounded and the speedy evacuation of casualties."

The portrait of a harassed (and excusably apoplectic) G.O.C. in the field, confronted with such a platitude, would be worth seeing. I suggest the idea to Mr. H. M. Bateman as a suitable subject for his inimitable brush.

It appears to me that a medical appreciation should have three objects :—

(1) To give the G.O.C. the information that he requires, and only what he requires, concerning the medical situation.

(2) To state how it is proposed to deal with the exigencies of the medical situation.

(3) To ask for everything that is required to deal with the medical situation.

I venture therefore to put forward my view that a medical appreciation is a specialized thing, for a special purpose, and that it is a square peg that cannot be successfully fitted into the round aperture of Ch. II, Section 25, para. 4, T. and M. Regulations.

It is obvious that all G.O's.C. will not require the same information, and I would deprecate any attempt to standardize medical appreciations. But, as an example, and as a possible help to prospective candidates, for sub-head (h) V, I append the following specimen. The strength of the force was 20,000, operating in a tropical country. It will be noted that of the three objects of a medical appreciation, (1) is covered by paras. 1-3, (2) by paras. 4-5, and (3) by paras. 6-8 of the attached appreciation.

All detail, calculations, etc., i.e., matter to which the G.O.C. might wish to refer, but which is not essential to the connected idea, have been relegated to appendices.

Recommendations based on Appendix 3, "Topographical Considerations," need not be given, as they would be included in Standing Orders. This should be stated, as some Boards might consider it an omission.

A simple method of checking "The Stability Figure," i.e., the numbers remaining in hospital at the end of the twentieth day onwards, is to multiply the daily admission-rate by 13·3.

SUGGESTED SCHEME FOR A MEDICAL APPRECIATION BY THE SENIOR ADMINISTRATIVE MEDICAL OFFICER OF A FORCE.

INDEX (on Cover of Appreciation).

"SECRET.

MEDICAL APPRECIATION OF THE SITUATION ON .... (DATE)
BY MAJOR .... R.A.M.C., S.A.M.O., ... FORCE
REF. O.S. .... (COUNTRY) .... (SCALE) ....
SHEET ...."

APPRECIATION.

Para. 1.—*Outline of Evacuation.*

After consultation with "G" and "Q" this has been settled as follows :—

From C.C.S. at .... by Ambulance Train and Temporary Ambulance Trains to ... . via

		Approx. mileage
(1)	—	....
(2)	—	....
(3)	—	....
(4)	—	....

Arrangements for feeding, resuscitation, treatment, etc., have been made at all the above stations at which no medical unit is located.

Note.—(1) The possibility of evacuation from .... to .... by river craft has been considered and rejected on the grounds of slowness and difficulties of navigation.

(2) Owing to the number of ambulance trains and temporary ambulance trains that can be run daily from C.C.S. at .... to .... being limited, it is considered essential that one extra M.A.C. should be kept in Force Headquarter reserve.

(3) It is hoped that it will be possible in about three months to supplement this scheme of evacuation by the use of six Air Ambulances and twelve Armoured Motor Ambulances already ordered by "Q."

Para. 2.—*Accommodation.*

The following accommodation will be required :—

(*a*) Wounded ... ... See App. 1

The total number of wounded on any one day for whom hospital accommodation is needed is estimated at 1,296

(*b*) Sick ... ... See App. 2

Sick admissions to General Hospitals will rise to 1,330 by .... After this date this figure will remain approximately constant. This is based on a daily admission rate of 0·5 per cent daily which is likely to rise to 1 per cent by 1,330

(*c*) Refugees	See App. 4
(These can be accommodated in civil hospitals and attended to by civil medical practitioners)	
(*d*) Prisoners of War	600
Sick and Wounded P. of W. will be cleared from the forward area and accommodated in a selected General Hospital.	
(*e*) Reserve	374
Total	3,600
The following accommodation exists, i.e., two 600-bedded General Hospitals whose accommodation has been increased by crisis expansion by 50 per cent ...	1,800
Deficit	1,800

Therefore three additional hospitals of 600 beds are being asked for.

Para. 3.—*Effects of a Prolonged Campaign.*

There will be a progressive increase of sick wastage, especially as regards heat-stroke, malaria, fly- and water-borne diseases owing to the prevalence of flies, the primitive state of sanitation existing, and the general falling off in training of reinforcements in sanitary matters owing to the shorter period of instruction at the Depots.

Para. 4.—*Reinforcements for Medical Personnel.*

(*a*) Required immediately to replace battle casualties (estimated at 15 per cent of 3/5 of the total)

Medical Officers ....
Other Ranks ....

(*b*) Required at the end of two weeks to replace sick wastage (estimated at 0·5 per cent daily)

Medical Officers ....
Dental Officers ....
Quartermasters ....
Nursing Sisters .... See App. 5

Para. 5.—*Temporary Ambulance Trains.*

Staff and Equipment will be held in readiness for two of these, each accommodating 1,000 sitting cases.

Para. 6.—*Cleansing Units.*

An adequate number of these units should be provided by "Q."

Para. 7.—*Equipment.*

(*a*) *Medical.*—In addition to W.E. Scale, the following are considered necessary (Field Ambulance, C.C.S., and General Hospitals are being stocked accordingly):—

Anti-tetanic serum.
Anti-gas gangrene serum.
Oxygen supply with complete apparatus.

(*b*) *Ordnance.*—Recommendations are as follows :—

Special protective clothing for personnel dealing with mustard gas contaminations.

In order to allow for the complete change of gas-contaminated clothing, pyjama suits to be increased to the following scale :—

3 Field Ambulances at 250 each	...	750
1 C.C.S. at 1,200	... ...	1,200

(*c*) *Stretchers.*—The present scale should be increased by a reserve of 1,000 for the Force.

Para 8.—*Summary of Recommendations.*

(*a*) The following units, with personnel to W.E. Scale are urgently needed, and should be asked for immediately, in addition to those existing :—

3 General Hospitals (600 beds).
1 Convalescent Depot (2,000 beds).
1 Base Depot of Medical Stores.
1 Hygiene Laboratory.
1 Bacteriological Laboratory.
1 Motor Ambulance Convoy.
1 Ambulance Train.
2 Temporary Ambulance Trains (1,000 sitting cases).

Reasons in detail for these demands are given in App. 6.

(*b*) Authority requested for any move of units that are considered to be unsuitably sited in the narrative.

(*c*) Reinforcements for medical personnel, as estimated in para. 7 (*a*) above, should be demanded at once.

(*d*) The Equipment detailed in para 11 (*b*) and (*c*) to be obtained urgently.

(*e*) In addition to the scale of specialists allowed by W.E., the following consultants are considered necessary :—

1 Mental Specialist.
1 Eye ,,
1 Aural ,,
1 Consulting Entomologist.

" F.H.Q. ....

Major, R.A.M.C."

(Date)............ S.A.M.O..................Force.

Appendix 1. *Estimation of Wounded.*

10 per cent of 3/5 Divl. Troops 10 per cent of 1/5 Corps Troops }	1,800
Deduct 20 per cent killed	360
Total wounded any one battle	1,440
Deduct 10 per cent not requiring hospital treatment ...	144
Total wounded for whom beds are needed	1,296

Of these 40 per cent, or 520, will require evacuation to the Base.

Appendix 2. *Estimation of Sick.*

Sick admission at (say) 0·5 per cent daily = 100.
Of these 40 per cent, or 40, will be discharged in 7 days.
50 per cent, or 50, will be discharged in 7 days.
10 per cent, or 10, will need invaliding.

TABLE SHOWING ESTIMATED OCCUPATION OF BEDS BY SICK IN GENERAL HOSPITALS UP TO TWENTY-FIRST DAY.

Day	Admissions	Discharges	Evacuations	Remaining
1	100	—	—	100
2	100	—	—	200
3	100	—	—	300
4	100	—	—	400
5	100	—	—	500
6	100	—	—	600
7	100	40	—	660
8	100	40	—	720
9	100	40	—	780
10	100	40	10	830
11	100	40	10	880
12	100	40	10	930
13	100	40	10	980
14	100	40	10	1,030
15	100	40	10	1,080
16	100	40	10	1,130
17	100	40	10	1,180
18	100	40	10	1,230
19	100	40	10	1,280
20	100	40	10	1,330
21	100	90	10	1,330

After twentieth day, number of beds occupied by sick remains approximately constant, i.e., at 1,330, as discharges plus evacuations will balance.

Appendix 3.—*Topographical Considerations.*

(*a*) *Sanitation.*

Water Supply.—Piped supplies, chlorinated at source, are available in .... and the larger towns. Elsewhere the supply is from wells and is untreated. Owing to the porous nature of the soil, a high degree of water contamination is general.

Flies.—Prevalent everywhere and present a serious problem.

Mosquitoes.—Breeding actively now; this will increase later.

(*b*) *Prevalent Diseases.*

Enteric Group ... Bacillary dysentery	These two groups of diseases will cause a large proportion of the sick, as the sanitary conditions of the terrain afford serious danger from food and water contamination.
Malaria... ...	Mainly benign, with occasional malignant cases. The civil population is heavily infected and will act as a reservoir for the disease.
Venereal disease ...	Native civil population heavily infected.
Small-pox ...	Endemic; the risk to troops is small, owing to 100 per cent protection by vaccination.
Plague and cholera	Both diseases mildly endemic in the area.
Sandfly fever ...	
Rabies	Danger to troops from jackals and pariah dogs which are commonly infected.
Heat-stroke ...	Cases must be expected from now onwards, rising to a maximum in June and July.

Appendix 4.—*Refugees and Civil Medical Assistance.*

Civilian refugees requiring hospital treatment can be accommodated by Civil Hospitals. Apart from this little assistance can be expected from the Civil Medical Authorities, as they are fully occupied by normal peace time requirements.

Voluntary Aid and Red Cross. Possible assistance in personnel, stores and medical comforts only.

Appendix 5.—*Detail of Medical Personnel.*

Summary, excluding R.A.S.C., attached :—

Medical Officers	....
Dental Officers	....
Quartermasters	....
Nursing Sisters	....
Other Ranks	....

Including crisis expansion of General Hospitals personnel by 50 per cent.

These are distributed as follows :—

No.	Unit	M.O.'s.	D.O.'s.	Nursing Sisters	O R.'s.
15	Regtl. Medical Establishment	—	—	—	—
3	Field Ambulance (include one Force Field Ambulance)	—	—	—	—
1	Sanitary Section[2]	—	—	—	—
1	C.C.S.	—	—	—	—
1	M.A.C.	—	—	—	—

1	Ambulance Train	—	—	—	—
2	Temporary Ambulance Trains	—	—	—	—
1	General Hospital (600 beds) do.	—	—	—	—
	On crisis expansion to 900 beds	—	—	—	—
1	Convalescent Depot ...	—	—	—	—
1	Advanced Depot of Medical Stores	—	—	—	—
—	Headquarters Office Consultants, etc.	—	—	—	—

[1] Quartermasters are not included.
[2] These are not necessarily Medical Officers.

Appendix 6.—*Reasons for Demanding Additional Medical Units.*

(*a*) 3 General Hospitals (600 beds).	See note at end of para. 2.
(*b*) 1 Convalescent Depot.	In order to approximate this accommodation to that of the General Hospitals.
(*c*) 1 Base Depot Medical Stores. 1 Hygiene Laboratory. 1 Bacteriological Lab.	According to the scale for the Expeditionary Force.
(*d*) I Motor Ambulance Convoy.	Additional for duties at Base on the L. of C. Also as a F.H.Q. Reserve.
(*e*) 1 Ambulance Train. 2 Temporary Ambulance Trains.	The return journey from .... to .... by the route indicated in para 1 will probably occupy .... days. The 1 Ambulance Train and 2 Temporary Trains, already provided, can evacuate 2,320 cases every .... days.

Estimated evacuation requirements are :—

40 per cent of battle casualties	520
60 per cent of daily sick...	60
	580 daily
	or 4,460 in 8 days.

Of these, the existing trains can deal with half (2,320). Therefore the number of ambulance trains should be doubled.

Appendix 7.—Location of Medical Units after Consultation with "G" and "Q."

No. 1 C.C.S.	Heavy Section at .... with light section at .... Map ref.
	Note.—As the C.C.S. is sited far back, a Divisional M.D.S. has been opened at . ... Map ref.
No. 1 M.A.C.	at .... Map ref.
No. 1 Amb. Train	Garaged at .... Map ref.
No. 1 Advanced Depot Medical Stores	at .... Map ref.
No. 1 General Hospital	to .... from ....
No. 1 Convalescent Depot	at .... Map ref.

An appreciation on this plan works out at 3½ foolscap pages—double spacing—with 4½ pages of appendices. The appreciation should not exceed these limits, but the appendices, which need not be read by a G.O.C. (or by the "G" representative on an Examining Board) may be expanded as required.

The above appreciation has been brought up to date as far as possible in accordance with amendment No. 6 to App. X, K.R.

I am indebted to Major E. C. Linton, R.A.M.C. for criticisms and suggestions and to Major H. R. Deane, G.S.O. 2, Lucknow District, whose remarks on the writing of medical appreciation from the point of view of the General Staff, follow.

(1) I agree with Major Wade that the accepted form of appreciation given in T. and M. Regulations cannot be slavishly applied to the type of medical appreciation which he has in mind in this article, or, for that matter, to any other type of medical appreciation.

(2) In a strategical or tactical appreciation, the author endeavours to find the best solution to a concrete problem or problems, expressed in the "Object."

The type of medical appreciation under consideration is really a review of a particular situation from the medical point of view, involving consideration of many aspects of medical activity, mainly administrative.

Each of these aspects presents definitely an independent concrete problem to be solved, although it may be bound up to a greater or less extent with the others.

The medical appreciation, therefore, while it will have the three general objects given so clearly by Major Wade, resolves itself into a number of separate, but probably inter-related "appreciations," each one of which has its own "Object," e.g.: "In the circumstances and with the means at our disposal, what is the best method of evacuating the sick and wounded ?"

To " appreciate " this situation, " factors " such as means of transport available, their general suitability, the effect of particular enemy action, etc., may have to be considered, and must be threshed out with the Branches of the Staff concerned previously. The " Plan " of this appreciation will be the system of evacuation recommended.

To a certain extent, therefore, the appreciation will agree with the form given in T. and M. Regulations, but the heading, " Courses open to both sides " appears quite inapplicable.

(3) The G.O.C. who has to read the appreciation, or the Staff Officer who deals with it on his behalf, certainly will not want to wade through masses of literature before he can discover what he wants to know.

I suggest that " what he wants to know " should be the first thing to meet his eye, and should include the following :—

(*a*) Whether the medical resources available will be able to meet successfully, as they stand, the operations in view.

(*b*) If there are weak links in the chain, what are they?

(*c*) What extra transportation facilities, hospital accommodation, medical personnel and equipment will be necessary to make the weak links strong?

(*d*) In general terms, how is it suggested the medical services be organized and located for the operations in view.

If the appreciation leads off with the above, the separate appreciations, already referred to, calculations, &c., can then follow in logical order, and can be referred to by the sender, if desired.

(4) The appreciation would, therefore, be put up very much in the form of a Reconnaissance Report, and would consist of Part I, " Requisite information given as briefly and concisely as possible " ; Part II, "Detailed information."

(5) The foregoing, of course, is merely a personal idea, for the elaboration of which time has not permitted, and does not bear the seal of official approval.

Editorial.

A TRIUMPH OF PREVENTIVE MEDICINE.

THE story of twenty-five years of American medical activity on the Isthmus of Panama, 1904-1929, as related by Colonel Weston P. Chamberlain, may justly be regarded as a triumph of preventive medicine.

The idea of making a ship channel across the Isthmus of Panama appears to have originated in the sixteenth century, and Cortés was the pioneer in this ambitious scheme. In 1529 and 1534 plans and surveys were made to determine the most advantageous route for the canal. Nothing further happened until 1616, when Philip II caused plans to be prepared by Diego Fernandez de Velasco for a channel, via the Gulf of Darien.

In the eighteenth century sporadic attempts were made to find a route, but it was not until 1881 that de Lesseps undertook the actual construction of a canal across the Isthmus of Panama. This attempt unfortunately failed because the French had at that time no knowledge regarding the part which mosquitoes play in the transmission of malaria and yellow fever. The French company also had no power to enforce sanitation in Colombian territory, through which the line of work passed.

On May 4, 1904, the property of the French company was taken over by the United States, and North American personnel commenced the construction of a canal in accordance with the terms of a treaty negotiated by the United States and the newly-established Republic of Panama. Colonel William Gorgas came to the Isthmus with the full commission in April, 1904. By this time it was known that yellow fever and malaria were transmitted by the bites of mosquitoes, and by applying this knowledge Gorgas had been able to eradicate yellow fever from Cuba.

Armed with this knowledge and endowed by treaty with absolute sanitary jurisdiction over the cities of Panama and Colon, and a strip of land five miles wide on each side of the proposed canal, and provided with almost unlimited funds, the authorities from the United States were in a position to deal effectively with the health situation on the Isthmus.

Physical conditions along the route of the Panama Canal are extremely favourable for the propagation of mosquitoes and for the development of malaria parasites in mosquitoes. The mean monthly temperature ranges from 79° F. in November to 81° F. in April. The rainy season comprises eight or nine months out of the twelve, and the mean annual rainfall varies from 70 inches on the Pacific side to 130 inches on the Caribbean littoral. Extensive swamps surround the City of Colon and the Atlantic terminus. Elsewhere along the canal route the soil is of a non-absorbent nature for the most part. Prior to 1904 human acts facilitated the pro-

pagation of mosquito-borne diseases. In the cities of Colon and Panama there were no modern pavements, no sewers and no public water supply. Cisterns, tanks and barrels installed for the storage of rain-water provided innumerable large-scale opportunities for the breeding of *Aëdes ægypti*, and small-scale breeding places were afforded by numerous cans, plant-pots, vases, sagging house gutters and holy-water fonts. Ditches and adjacent lakes and streams bred malaria-carrying mosquitoes. House screening was practically unknown. In the French hospitals patients sick with yellow fever or malaria lay in unscreened wards.

About 135 species of mosquitoes have been identified on the Isthmus, but most of them breed and spend their lives in the jungle, rarely attacking man. The most important mosquitoes are those which transmit malaria and those which transmit yellow fever. Of those which transmit malaria the principal offenders are *Anopheles albimanus* and *Anopheles tarsimaculatus*. These breed in swamps, streams and pools *when exposed to sunlight*. Under favourable conditions they can enter houses one mile from their place of origin.

Aëdes ægypti is the mosquito which transmits yellow fever, and is essentially a domestic mosquito, laying its eggs in artificial collections of clean water about the house. It only flies short distances.

There are other mosquitoes which only cause annoyance by their bites; of these *Aëdes tæniorhynchus* is the most troublesome; it breeds in pools and can fly for miles. *Mansonia titillans*, whose larvæ obtain oxygen beneath the surface from the roots of aquatic plants, is also a long-distance flyer which causes marked annoyance.

In connection with general procedures essential for the control of mosquito-borne diseases, Colonel Chamberlain reminds us that a mosquito cannot transmit yellow fever or malaria until it has bitten an infected person and lived long enough (about twelve days) for the parasite of the disease to pass through its cycle of development in her body. Out of 100 mosquitoes only a small number will have the chance to bite a human being during the period that his blood contains the parasite in an infective state, and of these many will die before the twelve-day cycle is completed, and of those which survive all will not have the opportunity of biting a susceptible person. There are therefore critical points related to the number of infected mosquitoes and the number of infected individuals. If the numbers are above the critical points there will probably be an epidemic, if they are below only sporadic cases will arise. It was a comparatively easy matter to eliminate yellow fever. The *Aëdes ægypti* mosquito being a house breeder, or a short-flying domestic species, the introduction of a piped water supply in every house, and on its completion the prohibition of the use of cisterns, tanks and wells, causes a rapid reduction in its numbers. Roof-gutters were also prohibited, and constant sanitary inspection prevented the breeding of mosquitoes in vases, plant-pots, etc.,

The yellow fever patients being infective only during the first three days of the disease could, with the aid of early diagnosis, be placed in screened rooms beyond the reach of mosquitoes, if any were still about. Infected mosquitoes generally remained localized to the room occupied by the patient and could be easily killed by fumigation.

One attack of yellow fever confers immunity, and the indigenous populations are largely immune. Taking advantage of these facts, General Gorgas was able to eliminate yellow fever from the Isthmus in a short time. The last case to develop locally occurred in Colon in May, 1906. The last case in Panama City occurred on November 11, 1905.

Continued efforts maintain a low *Aëdes ægypti* index in the towns of the Canal Zone and in the cities of Panama and Colon. The number of houses in which any breeding occurs is less than one per cent. Certain investigators have estimated that unless the number of houses in which breeding occurs rises above five per cent, there will not be sufficient mosquitoes to transmit the disease in an epidemic form, even if cases of yellow fever are introduced and are neglected as regards sanitary precautions.

Colonel Chamberlain tells us that statements to the effect that malaria has been eliminated from the Canal Zone are erroneous. To free the Canal Zone would require years of effort and the expenditure of millions of dollars. Anti-malarial efforts have been confined to the more important towns and their environs. Within these "sanitated" areas are concentrated the bulk of the Canal employees, as well as the military forces and their families. Elsewhere in the Canal Zone practically all employees and their families live in thoroughly screened quarters, but no anti-mosquito work is carried out.

Compared with yellow fever the prevention of malaria is a far more difficult problem. The mosquitoes are rural breeders, and fly long distances to obtain the meal of blood they require for the propagation of the species; a large portion of the indigenous population living outside the sanitated area is chronically infected with latent malaria; those who contract malaria remain infective for considerable periods, during which they cannot be shut up in a screened room, as is the rule with the yellow-fever patient for his three days of infectivity; one attack of malaria confers no immunity.

Antimalarial work on the Isthmus has passed through several quite distinct phases.

There was first the attack against malarial parasites in man by vigorous treatment and the prophylactic use of quinine. Prophylaxis was only used in the early organization period, before more efficient methods were inaugurated.

Then followed an attack against adult mosquitoes by cutting away sheltering brush-wood, screening houses and killing mosquitoes in dwellings; an attack against larvæ and pupæ by oiling breeding places; filling and draining large bodies of water, training streams, etc., and lastly

permanent drainage. Clearing away the jungle within a zone extending 100 yards from habitations was one of the first sanitary measures adopted by Gorgas. This procedure made it easier to detect pools and favoured evaporation. It was thought that the destruction of shelter for adult mosquitoes tended to keep them away from habitations. The practice of grass-cutting was continued until 1919, when it was felt that the money spent for that purpose could be more usefully expended on extension of drainage schemes. Moreover, the important malaria-carrying mosquitoes did not breed in deep shade, and the cutting away of vegetation which provided shade over pools or streams often permitted dangerous anopheles development where none was occurring before.

Consequently the cutting of vegetation about habitations as a sanitary measure was discontinued, and Colonel Chamberlain states there has been no reason to regret this step.

The killing of adult mosquitoes was best carried out in screened houses, and was of much value in temporary camps where prevention of breeding was impossible or too costly. In Gatun between 5,000 and 10,000 anopheles per month were caught in the screened quarters of the employees during the wet season.

The destruction of larvæ by natural enemies such as small top-feeding fish was not an important factor in the control of malaria. It was necessary to remove the vegetation along the edges of bodies of water and to have clean, fairly steep banks to enable the fish to get at their prey.

Mineral oil of fuel grade was at one time extensively used for destroying larvæ. Expert coloured "larva hunters" regularly dipped and examined streams and ponds; if larvæ were found the areas were treated by heated fuel oil sprayed from a barrel-pump mounted on a boat which was slowly rowed along. The oil was heated to 70° C., and left the nozzle of the pump in a fine spray which formed a good film on water partly covered with vegetation. Control by oiling required attention every eight or ten days, and later it was thought better to expend the money on permanent drainage, where this was possible.

The importance of drainage in the reduction of malaria was early recognized, but the temporary nature of the labour camps rendered permanent works impracticable. During the past fifteen years conditions have become more stable. Panama, Colon and the Zone towns have been paved, sewered, and the sites graded by the Municipal Engineering Division of the Panama Canal, and the Health Department then started on a campaign for the elimination of the remaining breeding places. The training of streams and digging of ditches were replaced by subsoil field drains or concrete-bottomed open drains. Wherever the grade permitted the field drains were placed at least thirty inches below the level of the ground, and the trench was filled to a depth of twenty-four inches with broken rock. The concrete-bottomed drains were cast in three-foot sections of hemi-cylindrical shape, with a channel fourteen inches across and with inter-

locking male and female ends. In certain areas a new type of drain, named a "double-decker," has been tried. It consists of the ordinary pre-cast hemicylindrical section, with a six-inch or eight-inch field drain laid beneath it. This drain is used in localities where there is some water flowing all the year; the field drain takes the flow during the dry season, and the concrete open drain the storm water which commonly washed away the covering of the field drain. Between 1924 and 1928 many miles of this new drainage have been laid, and by the end of 1928 all open earth ditches in the City of Panama had been replaced by permanent drainage. Similar work has been speeded up during the last five years in the area between Paraiso and Ancon. On the Atlantic side as much permanent work as possible has been done, but owing to the flat swampy nature of the ground it has been impracticable to instal subsoil field drains except in the hilly region around Gatun. But great benefit has resulted from digging channels which open into areas of the sea at each end and permit a free circulation of sea water, thereby retarding growth of vegetation and encouraging the introduction of fish.

The results obtained by the antimalarial measures which we have outlined are truly remarkable. In 1906, when the average number employed was 26,547, the admissions to hospital were 821 per 1,000, and the deaths 7·45 per 1,000. In 1917, with an average population of 32,589, the admissions were 17 per 1,000 and deaths nil. From 1916 to 1925 the average number of employees was 19,578, and the admissions were 19 per 1,000; for the years 1926 to 1928 the rate has averaged only 13 per 1,000. The rates for employees are extremely accurate, as "no employee can remain ill as much as half a day without his disease being recorded," and all cases of malaria are admitted to hospital.

We agree with Colonel Chamberlain that "twenty-five years of sanitary work in Panama under physical conditions far more difficult than those found in Cuba have again convincingly demonstrated the adequacy of the mosquito theory as regards malaria and yellow fever, and have furthermore emphasized the truth of the modern precept that public health is a purchasable commodity. This striking and long-continued record of success, in a region formerly so notoriously unhealthy, is one of the strongest links in the chain of evidence which supports the recently evolved theorem that the white man can prosper in many parts of the tropics.

"By far the larger part of the morbidity and mortality formerly attributed to tropical *climates* was due, not to climate *per se*, but to isolation, nostalgia, venereal disease, alcoholic excess and, most important of all, to infection with specific parasites whose invasion is now almost preventable."

Clinical and other Notes.

A CASE OF EXTENSIVE INTRA-ARTICULAR LACERATION OF THE KNEE-JOINT WITH GOOD FUNCTIONAL RECOVERY.

By Captain T. DODD.
Royal Army Medical Corps.

On April 14, 1929, Fusilier R. was brought into the British Military Hospital, Wellington, having been run into on a bicycle by a motor lorry.

On examination he was seen to be suffering from shock, multiple abrasions, and a very nasty-looking lacerated wound over his right patella. He was accordingly taken into the theatre and anæsthetized.

The limb was then thoroughly cleaned up with iodine, and, under the strictest aseptic precautions, the superficial wound over the patella was excised. While this was being done the following points were noticed:—

(1) The anterior surface of the patella was bared down to the periosteum, the superficial tissues having been stripped off it in a triangular flap, having its base, two inches long, still attached to the vastus internus.

(2) At the base of this flap the laceration extended deeply. The vastus externus had been stripped completely away from its attachment to the patella, and the subjacent subcrureal bursa had been split open throughout its length; the split extended right through the capsule of the knee-joint to its attachment to the tibia. Incidentally, the men who picked R. up after the accident had remarked on the fact that they could see "the bones sticking out of his knee."

(3) The posterior end of the internal semilunar cartilage had been avulsed from its attachment to the spine of the tibia and was presenting out of the wound. This gave some idea of the degree of violence that must have been applied to the joint.

As soon as it was realized that the joint was open, all towels, gloves and instruments were changed, and a small tetra towel was clipped to the edges of the wound. The joint cavity was thoroughly irrigated with eusol, the presenting internal semilunar cartilage being then excised. The capsule of the joint was then completely closed with interrupted catgut sutures, and a drain placed down to, but not through, this suture line. The remaining torn superficial tissues were then sewn up as anatomically in layers as possible, and a second tube then placed in position, over which the skin was sutured. Dressings were then applied; the limb was placed on a back splint; and, a dose of A.T.S. having been given, the patient was removed to the ward.

After-course.—As soon as the patient came round from the anæsthetic the limb was swung. For the first three evenings after the operation he

had a temperature of 99° F., after which his general condition gave no further cause for anxiety. Both tubes were removed within forty-eight hours. The knee was at first very swollen and painful, the swelling being mainly peri-articular, and large quantities of blood-stained serum drained from the more superficial of the drainage tube holes. This was apparently due to the extensive muscle laceration. The discharge, however, ceased within a week. Stitches were removed on the tenth day, and the splint on the fourteenth. By this time all the wounds were firmly healed, the knee had regained its normal contours, though the vastus internus was very weak, and the patient was unable to support the weight of the limb off the bed.

Passive movements were then begun, followed by active movements and massage, and within six weeks of admission the patient was able to walk normally.

He was discharged from hospital on June 15, 1929. He then was able to bend his knee to over a right angle; he had no apparent derangement, instability, or abnormal mobility of the joint; and the vastus internus of the affected side had almost recovered its normal size, tone, and strength.

REMARKS.

The interest of this case lies in the following:—

(1) The extensive laceration, not only of the peri-articular, but also of the endo-articular structures of the joint, in spite of which the recovery of function was almost perfect.

(2) The very comforting vindication of the doctrine of irrigation and closure without drainage of even a comparatively grossly contaminated knee-joint.

I am indebted to Lieutenant-Colonel C. R. Millar, D.S.O., R.A.M.C., commanding the British Military Hospital, Wellington, for permission to publish the notes of this case, and also to Major G. D'R. Carr, M.C., R.A.M.C., Surgical Specialist, Madras District, for very kindly permitting me to conduct the case from the very beginning.

PERIPHERAL NEURITIS AS A COMPLICATION OF BACILLARY DYSENTERY ASSOCIATED WITH TREATMENT BY ANTIDYSENTERIC SERUM.

By Major A. G. BIGGAM, O.B.E.
Royal Army Medical Corps.

THE occurrence of polyneuritis following the administration of various antisera has been reported from time to time.

A similar type of neuritis has also been observed to occur during the course of an attack of bacillary dysentery, either in the acute stage of the disease or during convalescence.

L. Pollet [1] collected twenty-five cases with neuritic symptoms attributed to the serum treatment of various diseases. One case followed a rectal injection of Marmorek's serum for tuberculous enteritis, 2 occurred after antipneumococcic treatment, 4 after antidiptheritic treatment, and the remaining 8 after antitetanic treatment. Of these 18 cases only 6 followed definite attacks of the disease; the others came on after preventive injections. The onset of the neuritis he found to be nearly always late and generally preceded by erythema, urticaria, œdema and fever. The neuritis began with variable pains, either lancinating or cramp-like. The paralysis was found to set in from a few hours to two days later, and was soon followed by loss of muscular function. The region most often affected corresponded with the brachial plexus, especially the fifth and sixth cervical nerves. In many cases the paralysis was limited to one nerve. The reflexes were generally found to be diminished or abolished. The pain which occurred at first persisted for a considerable period in some cases. Atrophy of the muscles concerned was usual. Optic neuritis was observed as a complication. He attributed the occurrence of these cases of polyneuritis to the administration of foreign albumins.

W. Harris [2] states that repeated administration of antisera may be followed by symmetrical pains and tingling and the occurrence of muscular paresis.

He also observes that bacillary dysentery may be followed by severe and chronic bilateral sciatica, but that generalized multiple neuritis is rarely seen after the disease.

A. Coyon and J. Debray [3] describe a case of polyneuritis following an attack of bacillary dysentery of the Shiga type. The patient, a young girl aged 19, suffered from an acute attack of bacillary dysentery of Shiga type at the beginning of August, 1921. The dysenteric symptoms cleared up slowly. She received 110 cubic centimetres of antidysenteric serum during the treatment. No emetine was given. On October 25 of the same year she noticed she could not walk, and on examination she showed flaccid paralysis of the lower limbs, reflexes abolished and tenderness in the muscles on pressure; the arms also suffered, but to a less extent. There was anæsthesia in the left leg up to the knee, and in the right up to the junction of the lower and middle third of the thigh. Cerebrospinal fluid was normal. By January 7, 1922, the condition had markedly cleared and the patient was gradually recovering the use of the limbs. The tendon reflexes had reappeared in the arms some time before, and were reappearing in the right leg.

P. H. Manson-Bahr and H. M. Perry [4] describe the occurrence of peripheral neuritis following bacillary dysentery, the legs being generally affected; loss of knee-jerks, glossy atrophic skin, œdema of the ankles and hyperæsthesia of the calves are noted.

R. Ruge [5] observes that in the tropics, dysentery (probably bacillary) is fairly often followed by multiple neuritis, which may in certain circum-

stances be mistaken for beri-beri. Such cases, with antineuritic symptoms in the peroneal and crural regions, were seen by Luce and Meinecke. Offrem saw one involving the right plexus brachialis. The paralysis of the right arm lasted thirty-two days and then disappeared.

During the war the occurrence of polyneuritis amongst cases of bacillary dysentery was occasionally observed, and in some of these cases the fact that antidysenteric serum had been administered during the acute stage made it difficult to determine whether the neuritis had been produced by the dysenteric toxins or by the antidysenteric serum.

The following case, at present under my care, would appear to be worth recording because the same problem as to the ætiology of the polyneuritis arises.

S. M. M., male, aged 35, was admitted on April 22, 1929, complaining of diarrhœa with passage of blood and mucus and tenesmus, also pain and tenderness in the lower part of the abdomen, especially marked in the sigmoid region.

The present illness began suddenly ten days previously with about ten motions in the twenty-four hours, increasing up to twenty a day until admission, when the stools were found to be composed largely of blood and mucus.

Past History.—During the last five years the patient states he has had similar attacks about once a year, each lasting about twenty days. The attack previous to the present one occurred six months ago.

In the intervals between these attacks the patient states he has had no intestinal trouble and nothing abnormal in the stools.

Present Condition.—The patient is very weak and exhausted, tongue furred and rather dry. Temperature 38° C., pulse 110. The abdomen is tender, specially on the left side in the sigmoid region, where the gut can be felt hard, tender and contracted. Spleen and liver not enlarged. Heart not apparently enlarged, but first sound at apex of poor quality.

Urinary system: bilharzia ova (hæmatobium) present in urine, also few pus cells.

Nervous system showed nothing abnormal.

Culture of stools: Bacillus Flexner isolated and patient's blood agglutinated this organism.

Stools were negative for cysts and vegetative forms of *Entamœba histolytica*

Sigmoidoscopic Examination.—The passage of the instrument was somewhat painful and showed the rectum and pelvic colon diffusely red, inflamed and congested; widespread mucopurulent secretion was seen sticking to the wall of the gut.

Patient was put on diet and concentrated soda sulphate; antidysenteric serum, 100 centimetres, was administered intramuscularly on the day of admission and 60 centimetres on each of the following four days.

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His general condition gradually improved, the motions becoming less frequent, and blood and mucus soon disappeared from the stools.

On April 29, 1929, eight days after admission, the patient complained of numbness in his feet, which gradually spread up to his knees, and this was accompanied by pain and tenderness in the calves; five days from the onset of the paræsthesia the patient had lost all superficial sensations as high as the knee on both sides. Knee- and ankle-jerks were now absent and very marked weakness was present in the legs, especially affecting the muscles below the knee and completely incapacitating the patient from walking.

The abdominal and cremasteric reflexes were present, but plantar stimulation elicited no response.

There was no bladder or bowel trouble.

In the upper limbs the only thing complained of was numbness in the finger-tips of both hands. There was never any anæsthesia or weakness discovered in this region.

The skin of both feet, especially in the soles, became markedly glossy and perspiration in this region was very profuse.

The patient was obviously suffering from peripheral neuritis, but the ætiology of the condition required very careful consideration, so as to determine whether it had been produced by the toxæmia resultant from the dysenteric infection or whether it was the result of the antidysenteric serum given during treatment.

As no other signs or symptoms of serum sensitiveness, such as urticaria or joint pains, had been observed in this patient during the administration of the serum, it was decided to try the effect of large doses of antidysenteric serum intravenously on the assumption that the polyneuritis was the result of the dysenteric toxæmia and not the result of the antiserum treatment.

On May 3, 1929, 100 cubic centimetres of anti-dysenteric serum diluted in saline was given intravenously, and this was followed by 80 cubic centimetres by the same route on each of the following two days. No reaction followed any of these injections.

On May 10 sensation had begun to return in the legs, spreading from the knees downwards, and rapid improvement followed, so that by May 24 superficial sensations had returned right down to the feet. The patient was put on massage and electricity, and the power rapidly improved in his legs, so that by May 18 he was able to get about with assistance.

Present condition on June 30: Power in limbs normal, development and tone of muscles good, plantar reflex, flexor, knee- and ankle-jerks still absent even with reinforcement: No sensory change present.

Conclusions.

It would appear from the rapid improvement in the peripheral neuritis that took place in this case after the large doses of antiserum intravenously that this neuritic disability had been the result of the dysenteric

toxins, and had not been caused by the antidysenteric serum administered during the early stages of the acute bowel condition.

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A CASE OF CYSTICERCOSIS (*CYSTICERCUS CELLULOSÆ*).

BY MAJOR G. H. DIVE, D.S.O.
Royal Army Medical Corps.

THE patient, aged 23, a healthy adult of European extraction, was admitted to the Royal Victoria Hospital, Netley, in February, 1929, having been invalided from India for epilepsy.

He was born in India, and up to this time had not been out of the country.

The first series of fits, three in all, began on July 19, 1928, and terminated on July 21, after which he was apparently free from attacks until March 12, 1929, when he developed a new and very severe series of fits which lasted until March 30. Careful examination failed to reveal any evidence of organic disease of the central nervous system. The fits continued despite treatment and the patient became gravely ill, a condition of lethargy, almost amounting to coma, supervening.

Occasional rises of temperature were noted between March 10 and 28, after which an irregular fever of a "typhoidal" type developed, terminating on April 15.

On March 27 he began to complain, when roused, of generalized muscular pains, and incontinence of urine and fæces commenced.

On March 30 a number of small, elastic, freely movable swellings were noted in the triangles of the neck and a few similar swellings in the subcutaneous tissue elsewhere.

The swellings, now recognizable as lenticular cystic bodies, became larger and many more could be palpated. The main distribution was: Scalp and face, triangles of the neck (most frequent), chest, back (frequent), fore-arms, groins, thighs, and calves. The largest were approximately two-fifths of an inch in length. Several were excised—actually from muscular tissue—and identified microscopically.

The patient's condition at the end of March was pitiable, anorexia and wasting being extreme—from then he commenced to improve and the fits ceased, although occasional incontinence of urine persisted until May 15.

Two slight fits occurred in June and nocturnal incontinence on one occasion, but by the end of the month he was apparently fully recovered, physically and mentally. The majority of the cysts had much decreased in size and could only be palpated with difficulty.

The total leucocyte count on March 30 was 23,000 (eosinophils 1·5 per cent), on June 7 it was 17,600 (eosinophils 16 per cent), and on July 5 it was 21,600 (eosinophils 16·5 per cent).

No record of helminthic infection was obtained in this case and frequent examinations of the fæces, both before and after the administration of an appropriate vermifuge, were negative.

I am indebted to Lieutenant-Colonel D. Ahern, D.S.O., R.A.M.C., for permission to publish these notes.

THE KAHN TEST AS A METHOD FOR THE SERUM DIAGNOSIS OF SYPHILIS.

By Major R. F. O'T. DICKINSON, O.B.E.
Royal Army Medical Corps.

The growing tendency to employ one of the flocculation tests in the serum diagnosis of syphilis, owing to their great simplicity, led us to use the opportunities existing at Woolwich to "try out" the Kahn test side by side with the Wassermann reaction. Three hundred sera in all were examined when the approach of the trooping season with its necessary changes brought our work reluctantly to a conclusion.

The plan adopted was to take the sera which gave a positive Wassermann reaction and test them by Kahn's method, and in addition to include among the tests sera from early and treated cases of syphilis, and also sera from cases of general diseases.

Of the 300 sera examined, ninety per cent gave results which corresponded. The remaining ten per cent gave a positive or weakly positive Kahn, plus a negative Wassermann reaction, and were made up of the following types of cases: (1) syphilis (early), 5; (2) syphilis (old or treated), 13; (3) venereal sore, 4; (4) general diseases, 8 (weak positive).

On analysing these cases we find:—

Types 1 and 2.—The Kahn reaction apparently detected the syphilitic antibody where the Wassermann reaction did not.

Type 3, i.e., four cases of venereal sore, consisted of one case of early syphilis which gave a strong positive Wassermann a week later, one case who was an old syphilitic undergoing treatment, and two cases which gave a weak reaction, i.e., non-diagnostic.

Type 4 consisted of various general diseases, and gave weak positives which were non-diagnostic.

Our results, therefore, based on 300 cases, appear to show:—

(1) All sera which give a positive Wassermann reaction will give a positive Kahn.

(2) The Kahn reaction appears earlier in the disease and persists after the Wassermann reaction has disappeared under treatment, and that it ought to serve as a better guide with regard to the amount of treatment required in an individual case.

(3) Given a properly made, and correctly titrated antigen, the Kahn test is quicker, simpler, and at least as effective as the Wassermann reaction in the serum diagnosis of syphilis.

My thanks are due to Colonel E. McDonnell, D.S.O., for kind permission to publish this article, to Major C. F. White, O.B.E., R.A.M.C., for supplying sera for examination and for the interest he has taken in the work, and to Serjeant Welch, R.A.M.C., for help in carrying out the tests.

Travel.

FORTY DAYS PRIVILEGE LEAVE FROM INDIA TO BAGHDAD.

By Mrs. T. P. BUIST.

KARACHI is generally considered to be one of the best plains stations in India as regards climate, and as the hot weather comes round there is happily no need to contemplate a journey to the Hills, involving a family separation of perhaps six months. The question of how best to spend one's privilege leave, however, presents some difficulty here, as to travel by train necessitates an arduous and dirty journey over the Sind Desert, where from April to October the heat is so oppressive that one prefers to remain at home by the sea breezes rather than brave the ordeal. On the other hand, from November to March, most hill stations are unattractively bleak and deserted. This year we solved the problem completely to our satisfaction by a holiday up the Persian Gulf and on to Baghdad, circumstances making it more convenient for us to be absent only forty days.

The climate up the Gulf varies considerably, according to latitude, but from October to April it is generally excellent, and particularly from November to the middle of March it is extremely bracing, and provides a very beneficial change after the heat of India. As the best of the cold weather in Karachi is generally over by February, we decided to prolong our winter by applying for leave in the beginning of that month, and seeking northern climes.

The British India Steam Navigation Company run two mail steamers a week up the Gulf from Bombay, via Karachi, to Basrah. The fast mail takes six and a half days from Bombay (five from Karachi). The slow mail, which stops at the Arabian and Persian ports, takes about fourteen days from Bombay (twelve from Karachi). The exact time depends on the

amount of cargo handled at the various ports. The fare is the same by both mails, the return fare from Karachi to Basrah and back being rupees 512.

We decided to travel up by slow mail and come down by fast. Accordingly, at 9 a.m. on February 3 we embarked on the s.s. "Bankura," and having settled our belongings in our comfortable two-berth cabin, went on deck to watch the last of the cargo being shipped, and see the motley crowd of third-class passengers, Indians and Arabs, Makranis and Persians, each displaying the stamp on his wrist to show he had been passed by the port doctor, and each encumbered by the most varied assortment of bundles, boxes and bags, parrots and cooking-pots, wives and children. Just before lunch we steamed out of the fine harbour and, rounding Manora breakwater, felt our holiday had really begun.

We kept well in sight of the rocky coast of Baluchistan till late that afternoon. At dinner we made the acquaintance of the ship's officers, and fifty per cent of the other first-class passengers—there were only two; a Scot from Dunfermline, and an extremely picturesque Arab sheikh, a pearl merchant returning to Dubai. We found the ship's officers most welcoming and unfailingly kind, and altogether we were a very happy family. The chief recreation on board was deck golf, an amusing game which involved a certain amount of skill and provided good exercise. There was also a piano on board and a good little library, so we were never dull.

Our first port of call, Gwadur, on the Makran coast, was reached after lunch on February 4. We anchored several miles out in the bay, opposite the Cathedral rock, a great high cliff with a rocky formation on the top most remarkably like the ruins of some old castle or monastery. The bay is very picturesque, with its background of bare rocky mountains. We did not go ashore here, as there was very little cargo and time was short, but there were great scenes of excitement unloading and disembarking deck passengers into the narrow, perilous-looking rowing boats.

Leaving Gwadur about 5 o'clock, we steamed across the Gulf of Oman, making for Muscat, which we reached at 4 o'clock next afternoon, firing a salute to the Sultan as we entered the harbour. Muscat is the most picturesque of all the ports up the Gulf. It stands in a cove with ridge upon ridge of black jagged hills towering behind, which look as if they must crowd the gleaming white houses into the sea. The harbour is flanked by precipitous rocks, an old Portuguese fort crowning one on either side. It is the custom for ships calling here at some time to have their name painted up on the rocks, and next day the second and third officers went ashore equipped with several pots of white paint and, choosing a conspicuous place, spent a hard morning's work emblazoning the good ship's name in letters ten feet high. After breakfast we went ashore, too, and explored the narrow streets of the bazaar, preceded by an Arab boy as guide. So narrow were the streets that in most of them we could touch

both sides with arms outstretched. A motor car in Muscat is quite out of the question. We climbed up the rock-hewn steps to the Portuguese fort which is now the gaol, and through a mediæval-looking iron-spiked gate, up to the battlements, where we had a most wonderful view of the lovely harbour and the bluest of seas breaking in a white ridge for miles along the coast. Prisoners with faces pressed close to their tiny grilled windows gazed longingly at us across the uneven courtyard, an arresting sight in such a romantic setting.

Before we left the town we caught sight of six white-robed beggars playing and singing in a narrow street, peered at by the curious eyes of women-folk. These beggars had managed to get on board at Gwadur, without tickets and without any money. The captain told us he often got stowaways, and sometimes he had to carry them all round the Gulf back to

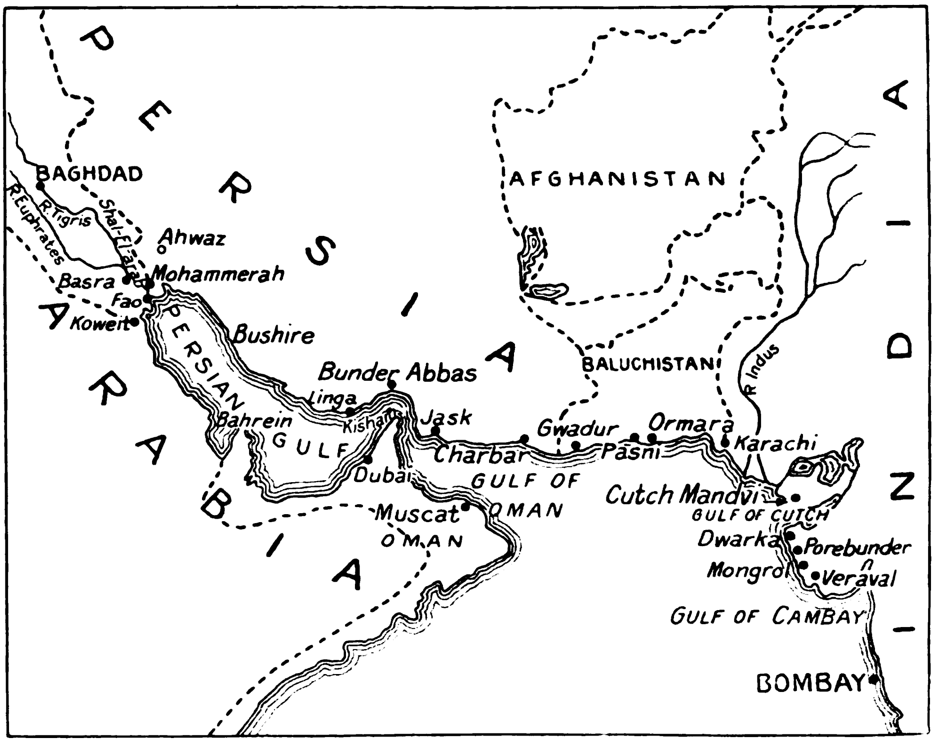
Muscat.

the port they came from, as without passports they were not entitled to land. This time they had been successfully off-loaded.

At tea-time on February 6 we left Muscat, and crossing the Gulf again awoke to find ourselves within sight of Jask, only three or four houses visible on a long spit of sandy ground fringed with palm trees, and rocky hills stretching up the other arm of the bay. One boat was all that was required to take off the cargo here, so we were soon ready to move off again. Great amusement was caused by two Persians who, in the frailest and smallest of reed boats, half swamped with water, had been paddling round trying to slip on board without tickets. One had actually abandoned his boat and got on the gangway before he was discovered and hustled off as the ship was getting under way. In desperation he made a flying leap for his friend's basket, which filled with water and turned over, emptying them both into the sea. The two could swim like fish, and their prolonged

antics and many shipwrecks before they got their boats finally righted and themselves safely inside caused us great amusement. We watched them paddling gingerly back to shore, their hopes defeated for at least another week.

We steamed close to the Persian coast all that morning, and by lunch time were in the Narrows with the mountainous coast lines of Persia and Arabia visible at the same time. Bunder Abbas, the first port in the Persian Gulf, was reached well after dark, and the cargo was unloaded throughout the night, so by breakfast time we were ready to set off again,



Map embracing area from Bombay to Baghdad.

and there was no time to go ashore. Caravan routes diverge from Bunder Abbas into the interior of Persia, and it looks quite a flourishing little town. This is one of the places in the Gulf where the air liners to India stop to refuel.

The same day (February 8), at lunch time, we reached Henjam, about a dozen houses and a wireless station on a rocky island, with a solitary tree visible. An American medical missionary came on board here, making the first-class passengers five in number.

Next morning, having crossed the Gulf again, we reached Dubai at 9 o'clock. Here there were no mountains to be seen, only a great sweep of

flat sandy coast-line, dotted at intervals with watch-towers. Dubai is a centre of the pearl diving industry. The Sheikh of Dubai allows no European to set foot in his territory unless with his own very special permission. The place is without any telegraph office or wireless station, in fact devoid of any of the amenities of Western civilization. It is said that the sheikhs resist such encroachments for fear of any interference with their numerous slaves. We arrived on deck after breakfast, in time to see practically the whole population approaching the steamer in a fleet of about fifty dhows, all in full sail, and in a few minutes the decks were swarming with humanity. The noise of tongues was deafening, and the excitement wilder than any we had yet come across. There were crowds of half-naked slaves, mostly negroes. A great many notables of the town, in gold-brown abbas, each with his dagger stuck in his belt, had come to welcome back our pearl merchant, who held dignified court on one side of the deck. The most spectacular of all was the Chief of Police. Besides his dagger he carried a long curved sword with a gold hilt, which seemed to incommode him considerably. He reminded us of Gilbert's Lord High Executioner. In return my own generous display of stockinged legs caused embarrassing interest, and I was soon surrounded by a wondering crowd. The rich pearl merchant went ashore here with his bedaggered friends. A carpet was placed in the stern of the boat, and twenty-four slaves, two to each oar, pulled lustily for the shore, chanting a refrain as they pulled.

Next morning we awoke to find ourselves still at Dubai, but we left at 9 o'clock. Half an hour before we weighed anchor a dhow drew alongside, and a negro slave was brought on board with his foot smashed, in a shocking condition. It turned out that this man had been brought a night's journey from a town twenty-five miles down the coast. The sheikh of this town had been shot dead the previous day by one of his slaves, whom he had discharged suddenly, after many years' service, without reason or so much as a sack of meal as reward. The slave in anger shot the sheikh dead, and had taken possession of the fort, where he was reported to be resisting the world at large. This other slave, who had been brought on board for the medical missionary's attention, had got mixed up in the affair and shot badly in the foot. Accordingly, after breakfast Dr. Dame, the missionary, with my husband's help, laid the patient on a hatch-cover on the well-deck, and together they amputated the foot, surrounded by an interested crowd of third-class passengers. Half-an-hour afterwards the man was sitting up drinking coffee and chatting with his companions.

On February 11 about lunch time we arrived at Bahrein, an island off the Arabian coast, and we anchored about six miles out. High seas made the unloading of the cargo impossible for the time being, but Dr. Dame, whose home was at the mission here, was anxious to get ashore with his patient, and he invited us to be his guests while the ship was in harbour. So with considerable difficulty, and great excitement, the wounded slave on

a hatch-cover was lowered by derrick on to a lurching dhow, while we followed, hoisted over in a coal-basket. Once clear of the ship, we sailed to land at great speed, on the crest of the wave.

The mission people were kindness itself. We stayed with them for two days. Besides seeing something of their devoted and unselfish work in the hospitals and the little school, we were driven over the island to see the fresh-water springs and the ancient mounds at Ali. The plain at Ali is covered with hundreds of these mounds dotted about as far as the eye can see. Some have been excavated and are found to contain a double-tiered T-shaped chamber, which must have constituted a grave, but there is nothing to throw light on their date or the early civilization that built them. We also visited the ruins of an old Portuguese fort on the island, and wandered in some fruit gardens where there were terinje trees, hung with great yellow fruit like large grape-fruit, and almond and peach trees in glorious blossom. The bazaar, too, we explored and found very picturesque, though, apart from embroidered abbas and gold and silver tassels, we saw no very striking wares exposed.

Bahrein is the chief centre of the pearl diving industry in the Gulf, which is carried on between June and October every year, but we did not see a single pearl in the bazaar. The pearl divers go down weighted with stones and a contrivance on their nose to prevent them from breathing, and they can stay under the water for a remarkably long time.

We left Bahrein at 6 a.m. on February 14, and once more crossing the Gulf we anchored off Bushire next morning. Bushire is the main seaport of Southern Persia, and from there a road leads over the mountains to Shiraz and the interior. We went ashore for a couple of hours and explored the narrow tortuous streets of the bazaar. The Persian shopkeepers, in their long dark robes and hats like inverted pudding-bowls, made no attempt to offer us their goods. They were a picturesque lot, but not so attractive as the Arabs, The Persian national hat, like a railway porter's in black or grey, is worn mostly by the official class, and struck us as very unbecoming. Apart from the bazaars there is nothing special to see in Bushire. We left the same afternoon, and at breakfast next morning (February 16) we anchored off Koweit on the Arabian coast.

The most notable thing on going ashore at Koweit is the number of wooden dhows under construction. Many of these are used for the pearl diving. The larger ones are merchant ships and travel far afield down the African and the Indian coasts, to Zanzibar, Colombo, and beyond. There was a large rambling bazaar here, through which we wandered with interest, though many of the shops were shut owing to Ramadhan.

Leaving Koweit that evening we crossed the bar of the Shatt-el-Arab in the dark, and awoke to find ourselves passing Abadan, the port of the Anglo-Persian Oil Company with its great refineries, situated twenty-eight miles from Fao at the mouth of the river. From Fao, for over a hundred miles up stream, a luxuriant belt of fine date palms grows on either bank.

These dates are packed for export and form a great source of revenue to the country, as each tree is taxed at the rate of one rupee yearly. As the trees have to be artificially fertilized, they also provide work for many. Twelve miles north of Abadan the steamer made a short stay at Mahomerah on the Persian bank, but we had no opportunity of going ashore.

On nearing Basrah about 3 p.m. it became evident that we were reaching a place of importance. First we passed a number of villas with gardens stretching down to the river, and then beyond Ashar Creek there were large buildings, offices and go-downs, while the river presented a busy scene, crowded with every kind of craft, a gunboat of the Royal Navy, a cable ship, merchantmen from the Gulf, barges, motor launches, and the quaint looking bellum, a narrow boat like a gondola, poled by a man at either end.

The city of Basrah itself is a mile or two from the river, adjoining Ashar on the river bank, but the jetties are about an hour's journey further up, at Ma'qil. The railway station for Baghdad and the north is just close to the docks, and it would have been possible to go north the same night, as the train left at 9 p.m. Basrah well repays a visit, however, but there is no good hotel, so that if the traveller has no friends with whom to stay the best plan is to sleep another night on board the steamer, and hiring a taxi drive the seven miles into the town to explore. We were fortunate in possessing friends with whom we stayed for twenty-four hours, during which time we explored the crowded bazaars and visited the fine Civil Hospital, drove out through the mirage in the desert, by the tower alleged to have belonged to Sindbad the Sailor, to the old Arab town of Zobeir, and in the quiet of the evening were poled in a bellum up lovely Khora Creek, where kingfishers skimmed the water, and here and there the bright pink of peach blossom lit up the green gloom of the banks. We found Basrah delightfully cool, During the day it was like pleasant English summer weather, and at night it was cold enough for a fire to be welcome.

Leaving Basrah at 9 o'clock on the night of February 18, we arrived at Ur Junction just before sunrise next day. Ur Junction is on the main line to Baghdad. The stationmaster at Ma'qil had wired for accommodation for us in the rest-house here, and the Indian khansamah had a cheerful fire going and quickly provided us with "chhota hazri," and later an excellent breakfast. The charges at the rest-house were fixed and very moderate, two rupees a night per head, with meals extra. No bedding other than mattresses is available. After breakfast we set out to see the excavations about a mile and a half away. Mr. Woolley and his party were finishing their season's work that week, and we were fortunate enough to see the year's "treasure trove" laid out ready for division between the Baghdad Museum, the British Museum, and the Museum of Pennsylvania. There is no need to enlarge on the exquisite golden cup, head-dresses, seals and ornaments that we saw, as these and all the absorbing history of the excavations are fully described in *The Antiquaries' Journal.* We spent

a wonderful morning. Later, in Baghbad, we were fortunate enough to hear Mr. Woolley lecture on the season's work.

The following day at 6 a.m. we caught the train on to Baghdad. The trains in Iraq are very much like the Indian trains. Chalumchis and bedding rolls are a necessity. There is a restaurant car on the Baghdad mail, and the meals we had there were reasonably good. The journey over the flat sandy desert is slow, and of course very dusty. About sixty miles south of Baghdad the train stopped at Hillah, where there is a comfortable station rest-house for those who wish to visit Babylon and Kish. The rest-house is run on the same lines as that at Ur, and it will be found easier and cheaper to step off the train here to see the excavations, either on the upward or downward journey, rather than hire a taxi from Baghdad, as the trip from there is expensive and the road is bad. A taxi from the rest-house to Babylon, four miles away, and back costs ten rupees a car, and to Kish and back, a distance of thirteen miles, the charge is fifteen rupees a car. However, as our friends in Baghdad had arranged to take us from there for a day's outing to Babylon, we did not get out at Hillah but went on to our destination, arriving about twelve hours after leaving Ur.

How shall I describe Baghdad, the busy city on the banks of the wide swift-flowing Tigris, its coloured domes and minarets towering up above the huddled roof-tops, its great bazaars thronged with pushing picturesque humanity and all the produce of the East! Perhaps its charm is doubly enhanced by contrast with the dreary miles of barren desert over which the traveller has passed. For it has charm rather than beauty—a charm that conjures up romance, the glamour of the Arabian Nights, shades of the Caliph Haroon al Raschid and his adventurous companions, of Flecker's Hassan and the travellers who seek the Golden Road to Samarkand. Apart from the mosques, there is architecturally nothing beautiful to look upon, save here and there a massive iron-studded door ajar, with the glimpse of the cloistered courtyard of some Arab house. Here are no spacious avenues of well-laid-out buildings. Instead, a network of narrow mysterious alley-ways, the sunlight almost excluded by overhanging windows, a network originally so impenetrable that, during the war, the Turco-German administration found it expedient to hack a straight street through the middle. Here, too, are acres of covered-in bazaars, so much more Eastern than any we had seen in India; the copper bazaar resounding with the clang of beaten metal, its red-hot furnaces, its gleaming rows of polished water-jugs, cooking vessels and coffee-pots; the belt makers weaving and embroidering belts of silver and gold thread and delicate coloured silks; the corner where abbas are embroidered, or where men with deft fingers are making the "agal"—originally a camel shackle—which the Arab wears round his head-cloth; rich-toned camel bells, carpets from Shiraz, Hamadan, and the four corners of Persia, bright-coloured silks from Meshed; all were so fascinating that we wandered there day after day.

And the gardens by the river were glorious, a paradise of flowering peach and apricot, and great groves of date palms, carpeted with emerald grass.

In the cold bracing afternoons we drove out into the desert to see Ctesiphon and Aqaquf, or to search for the remains of ancient forgotten cities. On these occasions gun and rifle were not forgotten, as sand-grouse, bustard, duck, gazelle, and even wolves may be encountered, and it was seldom that we returned without something for the pot. The golden domes of Khadimain we saw, and one whole day we spent in visiting Babylon, wandering among the ruins of Nebuchadnezzar's palace, by the famous stone lion, the Gate of Ishtar, and the Sacred Way.

As I mentioned, we were staying with friends. There are, at present, two tourist hotels in Baghdad, the Maude hotel, and the Carlton. These are about on a par with the average Indian hotel, and charge twelve rupees a day, inclusive of bath and afternoon tea. They will be found clean and reasonably comfortable. Taxis are four rupees an hour in the city, or forty-five rupees a day for a big car, ten per cent less for a smaller car. Taxis can be picked up in the bazaar for less than this, but they belong to less reliable firms.

All too soon our leave hurried by, and we had to pack up and return to Basrah to catch the fast mail home. Not relishing the prospect of another slow dusty rail journey over the desert, we decided to travel by air, the single fare being £7 sterling, as compared with approximately £5 by train. Accordingly, on March 8 at 7 a.m., after being weighed to see that ourselves and luggage did not exceed the regulation allowance of 225 pounds per passenger, we climbed aboard the Imperial Airways machine, the "City of Teheran," and rose up into the blue, waving good-bye to the swift-receding City of the Caliphs.

We bumped gently across the Tigris and Dialah rivers, and passing over Ctesiphon, climbed up to 7,500 feet, well above the dust storms that were blowing thickly beneath us. There in the comfortable cabin of the 'plane it was difficult to realize that we were moving. Miles upon miles of sand unrolled themselves below, and away to the east we caught a glimpse of the Persian mountains. At length we came to the marshes, with tiny villages dotted here and there amongst the reeds, and having crossed the Hammar Lake, after four and a quarter hours in the air, we made a perfect descent at Shaibah, where the company refreshed us with tea, and a car, chartered by wireless from the air, was waiting to take us and our luggage to the steamer at Ma'qil.

The steamer left next day at 4 o'clock in a pea-soup fog, which delayed us for several hours in the river. Our only stop was Bushire, where we picked up the mails, and on Thursday, March 14, at midday, after a pleasant voyage, we arrived back in Karachi, after one of the best holidays we have ever had.

Note.—Intending visitors to Iraq are advised to buy an excellent publication, entitled "Maps of Iraq with Notes for Visitors." This is

published by the Government of Iraq, and is obtainable from branches of Messrs. Thomas Cook and Son; The Crown Agents for the Colonies, 4, Millbank, London, S.W.1; Edward Stanford, 12, 13, 14, Long Acre, London, W.C.2; Sifton, Praed and Co., Ltd., 67, St. James's Street, London, S.W.1, price 5s. 6d., and from The Bookshop, New Street, Baghdad, Iraq, price Rs. 3.8.

Echoes of the Past.

CHOLERA IN THE ARMY IN INDIA OVER A HUNDRED YEARS AGO.

By Major W. W. S. SHARPE.
Royal Army Medical Corps.

As a sequel to the article by Major-General Sir W. H. Ogilvie, "Cholera in the Army in India nearly Fifty Years Ago," which appeared in the Journal in July, 1927, the following letter, written 112 years ago, may be of interest, especially the dosage and the last paragraphs dealing with the causation of the epidemic.

Major-General Ogilvie, in his article, mentioned that it had been stated in the old orders of fifty years ago that a lull occurred in an epidemic in the early part of the monsoon, and that it would be interesting if this could be proved or disproved.

Such a lull occurred in the outbreak amongst the civil population of the Ferozepore District in June to July, 1927, when the monsoon broke.

I am indebted to Major A. Villiers, Chief Ordnance Officer, Rangoon Arsenal, for this excerpt from Madras Army Orders, which he discovered whilst looking for records dealing with the history of his Corps.

1813. The Right Honourable the Governor in Council having received from The Most Noble The Governor-General, the printed copy of a letter from the Medical Officer in charge of the Native Field Hospital with the Centre Division of the Grand Army, relative to the treatment of the alarming epidemic which lately visited the Army, in its course through the provinces subject to the Presidency of Fort William; and His Excellency having expressed a wish for the speedy diffusion of this little Tract, as a means of averting much misery and distress:—The same is published for general information.

"My Dear Sir,—In compliance with your request to give you instructions for the treatment of the disease which prevails in Camp, from the circumstance of your being frequently detached from the Army without Medical assistance, I give you a Statement with much pleasure.

"The symptoms are as follows:—Violent vomiting and purging of watery matter, spasmodic cramp in the extremities extending to the

abdominal and muscles of the chest, a collapsed countenance, the pupil and the white of the eye covered with a thick film, a suffusion of blood and turgidity of their vessels, the eye at the length sinks into its socket and immediately becomes fixed. The extremities now become cold, and the pulse is not to be felt, and indeed the energy and action of the heart are considerably diminished.

"The first man I saw thus affected was treated with three grains of Calomel and a quarter of a grain of Opium every two hours with frequent draughts of Brandy and Water, and other stimulants, the man died and I opened him on the same evening.

"I found the stomach partly filled with muddy water the bowels were empty and considerably inflated with air, hardly any bile in the gall bladder, none in the biliary ducts, there was general inflammation of the bowels liver, stomach and lungs.

"There were indications to follow a directly opposite mode of treatment. Consequently, on assuming charge of the Native Hospital for the reception of Camp Followers, and Public Establishments, on the 16th of this month, one hundred and ten patients were admitted with the symptoms I have described.

"I immediately gave to each patient 15 grains of Calomel which I dropped on the tongue and washed it down with 60 drops of Laudanum and 20 drops of Peppermint in 2 ounces of water.

"Before I go further, it will be necessary to mention to you, that Laudanum in a large dose of 60 drops is not a stimulant but a sedative, whereas Laudanum from 15 drops to 20 & 30 is a stimulant, the former produces sound sleep, removes spasm and irritability, whilst the latter excites considerable uneasiness and convulsive startings.

"It will appear the more remarkable to you when I also mention that the variation of a dose of Calomel has the same effects.

"Calomel in a dose from 5, 8, to 10 grains excites lassitude, sickness, irritation of the bowels, and, on account of its being a stimulant, acts as a good purgative, but Calomel in a dose from 15 grains to 20 is a sedative, allays vomiting, removes spasm, sends the patient to sleep, and produces one or two motions.

"You will now observe on what principle I treated my patients, not on a plan of giving powerful stimulants, but on one which at once removes the irritability and spasm, composes the stomach and the bowels, produces sleep and tranquillity of the mind, excites the secretion of the liver, and prevents the progress of inflammation.

"On the second day it was indeed a consolatory sight to observe the wonderful change.

"The vomiting and purging had stopped, the spasms removed with general moisture on the skin, they had experienced sound sleep, and the pulse had returned to the wrist.

"I now gave 30 grains of Jalap which effected one or two bilious motions.

Of one hundred and ten men I only lost two, and those were decrepid aged men, in whom the vital energies were at once extinguished, the remaining one hundred and eight I had the good fortune to see all recover.

"In the treatment of Europeans, however, I should strongly recommend copious bleeding, and never less than twenty grains of Calomel with 60 drops of Laudanum and 20 drops of Peppermint in 2 ounces of water, and, on the spasm attacking the abdomen, the application of a large blister.

"Should the blister fail in drawing and the blood not flow from the veins, immersion in the warm bath will have the most beneficial effects. Should the warm bath not be procurable, warm friction; and pots of warm water thrown over the patient will produce an equally favourable result in bringing about the re-action of the circulating system.

"When the purging and vomiting are incessant, as well as violent we ought never to be alarmed in giving as far as 80 drops of Laudanum with 20 drops of Peppermint, and 20 grains of Calomel, and injecting 40 drops of Laudanum in Conjee by Enema.

"A few hours determines the safety of the patient, therefore those few hours must not be lost in an undetermined manner and by small and useless doses.

"After the first shock is over, that is, after three or four hours, if there's much spasm and irritability remaining, the dose of Calomel and draught must be repeated, the patient will then fall into sound sleep and awaken nearly recovered.

"The after treatment will only be to keep the bowels regularly open with Calomel and Jalap, and to give occasionally 60 drops of Laudanum to promote sleep. It is however to be remembered, that it would be an error and do considerable harm to bleed in persons who are weak, worn down by disease, and aged.

"The most urgent symptoms in this disease are violent thirst and dreadful sensations of burning heat in the bowels and pit of the stomach; the frequent and lamentable calls for cold water should never be satisfied, for I observed many unfortunate Camp Followers who had died in the act of drinking. I therefore gave warm Conjee, and by the means of Sentries prevented any water being taken into the Hospital.

"Hiccough is not a dangerous symptom in this disease, for there was hardly a patient recovered without suffering this spasmodic irritability.

"I am of opinion that unless a patient takes these remedies within 6 hours after the attack, the case is hopeless at least I only recovered ten patients with the regular form of the disease after a greater lapse of time, and in those the symptoms were peculiarly mild.

"It is of the greatest importance to bear in mind the necessity of giving Calomel in powder instead of pills, for I have known many instances where pills were passed through the patient in the same state and form they were taken into the stomach. This point therefore is of such high importance, that, in Fever, Dysentery, but above all, in this complaint, by

which a patient is carried off in 12, at farthest 30 hours after the attack, from which circumstance it becomes necessary to affect the system immediately, otherwise if this point should be over-looked the chief object in the operation of the Medicine may be frustrated and the patient lost.

"It is on this principle I recommend Laudanum in preference to Opium, one is directly active in it operation, but the other has to undergo the process of dissolving, or perhaps never dissolving passes through the system in the same state it was taken into the stomach without producing any effect whatever.

"I am so convinced of what I now assert and recommend that for these last three years I have never once used any Medicine in the form of pills. And I look back to the day when I first discovered this error in practice as one Great improvement in the treatment of acute diseases.

"Reading over the foregoing I find I have neglected to mention the use of peppermint in co-operation with Laudanum, the reason I prescribed it was, from its known good qualities in expelling air from inflated bowels and stomach, and I have always found it have that effect in the most desirable manner.

"That this disease is not infectious, I am perfectly convinced. All my attendants upon the sick have escaped the disease, and I have more particularly at all hours of the day and night respired the atmosphere of a crowded Hospital with impunity.

"But I fancy there have been a combination of causes, perhaps one of the principal was the sudden changes of atmospherical temperature, for I never knew the Thermometer vary so much as it has this season.

"In the morning at day break it stood at 52 and at one o'clock 96—a variation of 44 degrees in six hours and a half.

"I must beg leave however to decline at present entering into the causes; from recent investigation and circumstances it has put on more the appearance of being Epidemic, than it did on the commencement; but as I have leisure I trust I shall be able to correct any errors in this Letter, which is written during the pressure of other business.

Believe me, My dear Sir,

Yours Faithfully,

"Camp, Eritch. *Nov.* 26, 1817. sd/ Frederick Corbyn.

Asst.-Surgeon i/c of the Native Hospital,

Centre Division of the Army."

Current Literature.

O'Brien, R. A., Okell, C. C., & Parish, H. J. **"Diphtheria" in Schick-Negative Reactors.** *Lancet.* 1929, Jan. 19, 149-51. [9 refs.] [Wellcome Physiol. Research Labs., Beckenham, Kent.]

While Schick-negative individuals have a high degree of immunity to diphtheria, it may not be absolute in all cases owing either to exposure to a very large infecting dose or to an attenuation in the immunity owing to lapse of time. The latter factor only appears in a very small proportion of cases, 10 per cent. according to Park after 9 years and 2·9 per cent. according to Okell and Parish after 1—7 years. These points are related to the occurrence of diphtheria in Schick-negative persons, the subject discussed in this paper. After referring to the various types of error that may occur in the performance and reading of the test there is postulated the conditions that must be satisfied before the lesion can be regarded as diphtheritic. Before accepting a case as diphtheria the patient must have clinical signs of the disease, virulent organisms must be isolated from the lesion and bacteriological examination must exclude other probable causes such as Vincent's organisms and streptococci. The difficulties in clinical diagnosis were emphasized by Caiger and O'Brien in 1924. They found that of 436 patients admitted to the South Western Hospital (M.A.B.) provisionally diagnosed as diphtheria, in 41 per cent. the diagnosis was not confirmed, and in 21 per cent. the diagnosis of diphtheria made on admission to hospital could not be substantiated later on. The present paper, however, deals with 18 cases in which the Schick record and clinical diagnosis is not open to reasonable doubt. The first type of case, of which 2 examples are given, were nurses previously Schick-negative, who developed diphtheria and in whom the circulating antitoxin had fallen to a low level by the time of onset of the disease. In another type of case, diphtheria occurred although the patient was Schick-negative at the onset. Three examples are given and in these the development of the disease is explained by a temporary failure of active immunity in the face of an overwhelming infection. No attempt is made to classify the remaining cases in one or other of these groups owing to insufficient data, but only one was severe and it is suggested that the individual concerned had relapsed to a state of susceptibility indistinguishable from that previous to immunization. The outstanding feature of these cases is their rareness and mildness, the latter characteristic being ascribed to the capacity of those who have once been Schick-negative to respond rapidly by the production of antitoxin. In a sense therefore they can be described as suffering from "modified" diphtheria. It is also emphasized that in a

Schick-negative person suspected to be suffering from diphtheria the virulence of the diphtheria bacillus present and the antitoxin content of the blood should be investigated.

A. JOE.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 8.

LEREBOULLET, P., & GOURNAY, J. J. L'immunisation anti-diphtérique par l'anatoxine à l'Hôpital des Enfants-Malades (organisation et fonctionnement d'un centre de prophylaxie antidiphtérique). **[Immunization by Anatoxin at the Hôpital des Enfants-Malades.]** *Ann. Inst. Pasteur.* 1929, v, 43, 181-9.

For many years the *Hôpital des Enfants Malades* has served as a centre for prophylaxis against diphtheria. Prior to the introduction of anatoxin, the brothers, sisters and neighbours of the diphtheria patients were examined and swabbed and when necessary received prophylactic injections of antitoxin which conferred on them a transient immunity. Since 1924, however, anatoxin has been used for inoculation for orphanages, creches, schools and workmen's dwellings. It has been found that 3 injections of anatoxin, consisting of 0·5, 1 cc. and 1 cc. respectively produce immunization in 98 to 99 per cent. The second injection is given 3 weeks after the first, and the third a fortnight after the second. Local or general reaction occurred in only 10 per cent. of the cases. There are no contraindications to inoculation, though it is advisable not to inoculate children when they are ill or suffering from an eruptive fever or other disease.

The best age for inoculation is between 1 and 2 years. If inoculated earlier they are less liable to become immune, and it is in the course of the second year that the greatest number of positive Schick reactions is found and the incidence of diphtheria is highest.

Adults, such as medical students and nurses, who have been exposed to infection and show a positive Schick reaction are given first 1/10 cc. and then ¼ cc. and ½ cc., and after such doses rarely have violent reactions.

The injections were usually given on the outer side of the thigh.

The authors' experience of inoculation by the nasal route (see this *Bulletin*, 1927, v. 2, 664, 926; 1928, v. 3, 974) has not been sufficient to enable them to judge of its efficacy.

As the result of their observations on the combination of anatoxin with refined serum, the authors have found that the incidence of 88-90 per cent. negative Schick reactions after 2 injections of anatoxin fell to 65 per cent. if the refined antitoxin was injected at the same time as the first dose of anatoxin. In cases where 2 simultaneous injections are necessary the authors now give the first dose of anatoxin a few minutes before serum and the second one 3 weeks later when the antitoxin has been eliminated.

As regards treatment of carriers, the methods hitherto employed have failed, such as irradiation of the buccal cavity and nose with ultra-violet rays and lavage of the nose and throat with various antiseptic solutions.

It was often found, however, that carriers had enlarged tonsils and adenoids and in such cases operation gave excellent results after inoculation with anatoxin.

J. D. ROLLESTON.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 8.

RAMON, G., & HELIE, G. I. **Diphtheria Prophylaxis in France. Experiments with Anatoxin Vaccination.** *J. Amer. M. Ass.* 1928, v. 91, 1028-33. [1 ref.] [Pasteur Inst. & American Hosp., Paris.]

The authors mention the disadvantages of diphtheria toxin-antitoxin mixture as a prophylactic. These are the complicated method of preparation from which, despite all rules and regulations, the risk of accident has not been completely eliminated, the slowness and relative inefficiency in some persons of the immunizing process, the instability of the mixtures, and the risk of sensitizing injected individuals to horse proteins. For these reasons hygienists in France have been slow to adopt this method of prophylaxis and only one experiment, that of ROHMER in Strasburg, was made with toxin-antitoxin. In 1923 a new antigen, anatoxin, was discovered in France. This is prepared by adding 4 cc. of a commercial solution of formaldehyde to a freshly filtered litre of diphtheria toxin and maintaining at a temperature of 38° to 40° C. for one month. The resulting product must show that it has intrinsic antigenic properties when measured by the flocculation test and be harmless to susceptible animals. The flocculation test is carried out *in vitro* by mixing various unit doses of a standard antitoxin with 1 cc. of anatoxin and in this way the anatoxin is easily standardized. Anatoxin is tested for toxicity by the subcutaneous injection of 5—6 cc. into guineapigs which should survive the inoculation for a month. The anatoxin is very stable (one sample has retained its antigenic value for 5 years) and may be kept for several years without showing any toxicity. It may also be treated at 65 or 70° C. without losing any of its properties. Containing no horse serum it does not render human beings sensitive to these proteins. Its antigenic value is high, guineapigs which have received two injections of 1 cc. at a 3 weekly interval being able to withstand several thousand minimal lethal doses of toxin 10 days after the last immunizing injection. The antigen has been extensively used for the preparation of diphtheria antitoxin in horses and the antitoxin so produced is equal to that produced by the older methods. When used in human beings with an already existing basal immunity, one injection of 0·5 cc. of anatoxin raised the antitoxic content of the serum from 0·1 of a unit to 2, 5 or 10 units and in some cases to 50 units. In Schick-positive individuals one or two doses rendered them Schick-negative. Continued experiments showed that the optimum results in human beings could be secured by 3 injections of 0·5 cc., 1·0 cc., and 1·5 cc. at intervals of 21 days between 1st and 2nd and 15 days between 2nd and 3rd. During 1924, 1925 and 1926 much immunization has been carried out, the antigenic value

of anatoxin employed being between 10 and 12 antigenic units as determined by the flocculation test. Reactions, generally local if they occur, are due to certain specific proteins and are not the result of the presence of toxin. In a large series of cases there have been 20—40 per cent. of slight, 10—15 per cent. of moderate, and 1—5 per cent. of strong reactions. Up till August, 1928, more than a million injections of anatoxin have been made in France without serious incident or fatal accident. Schick testing has revealed the high immunizing value of anatoxin when employed by various workers in various parts of the country, and in general the results show 90 to 95 per cent. of susceptible patients are Schick negative after 2 injections and 97 to 100 per cent. after 3. This result is brought about in from 5 weeks to 2 months. The resulting protection has been proved to remain for various periods up to 4 years and is sufficiently rapidly produced to make it a valuable prophylactic during epidemics. Examples are given of the use of anatoxin in this way and it is claimed that the spread of diphtheria has been prevented. This, in conjunction with its other advantages, has caused the French Academy of Medicine to recommend its adoption in France. It is stated that the numbers immunized in France have increased from 100,000 in 1927 to 300,000 in the last few months, and it is hoped that, since the French Minister of Hygiene has also recommended the process, the number will be further increased.

A. Joe.

Reprinted from "Bulletin of Hygiene," Vol. 4, *No.* 8.

Benson, W. T. **Active Immunisation against Diphtheria and Scarlatina.** *Edinburgh M. J.* 1928, v, 35, 617-29, 1 fig. [5 refs.]

Since 1922 in the City Hospital, Edinburgh, 402 nurses have been Schick-tested and of that number 57·96 per cent. were positive. In 1925 Dick-testing of the nursing staff was commenced and of 251 nurses 32·66 per cent. were positive reactors. Schick-positive reactors have received courses of immunization of 3 injections each of 1 cc. toxoid-antitoxin, and Dr. Benson has conducted an investigation with a view to determining the best course of immunization for producing protection against scarlatina. He has varied the dose of the antigen and the time interval between injections, his total dosage ranging from 10,000 to 66,000 skin-test doses. After the injection of diphtheria prophylactic, local reactions were occasionally met with, constitutional reactions of even moderate severity were uncommon and in only 2 out of 221 nurses did the reaction prove a barrier to the continuance of the procedure. During active immunization to scarlatina out of 78 nurses about one-third complained of constitutional reactions, of headache and malaise, and these followed a first or second injection of 1,000 or 5,000 skin-test doses, the relatively large final injections of 20,000 or 30,000 skin-test doses being well tolerated. In a group of 140 susceptible children who were protected it was found that a primary dose of 1,000 skin-test doses may be expected to give a mild general reaction in one child in

twenty. Eleven of fifteen cases in which vomiting occurred had shown a large and brilliant preliminary Dick reaction. In most cases showing a systemic reaction this tended to recur with successive injections but in no case was it alarming.

With regard to the development of immunity to diphtheria it was found that among 143 nurses who received the full course 95·1 per cent. had developed full immunity within one year. The development of immunity to scarlet fever is more rapid and in a group of nurses receiving 26,000 to 66,000 skin-test doses of toxin all were Dick-negative in 6 weeks. After protection against diphtheria the author has noted that 90 per cent. of a group of 50 children originally Schick-positive were negative at the end of 4 years. The duration of immunity after scarlatinal immunization is still uncertain, and in a recent group of 28 nurses the duration in 6 cases was 3—6 months; in 7 cases 7—12 months; in 8 cases 13—18 months; and in 7 cases 19—24 months. Of the last number 1 had received 10,000 skin-test doses, 4 received 12,750, 1 received 22,750 and 1 received 27,000. The results seem to indicate that increase in dosage of antigen influences the rate of development of immunity rather than the subsequent duration. During 1923 to 1927 inclusive 17 cases of diphtheria have occurred in the nursing staff and 16 of the cases occurred in known Schick-positives. The one case in which diphtheria occurred in a Schick-negative was mild and the subject had a poor record of health in the hospital. In two and a half years, 6 nurses had contracted scarlet fever, but only 1 case had occurred since July, 1926. Of these, 5 were Dick-positive and 2 became infected 27 and 60 days respectively after an immunizing course of 12,750 skin-test doses. The value of a negative Dick reaction as an evidence of immunity is supported by the fact that 97 cases wrongly supposed to be suffering from scarlet fever on being proved Dick-negative were permitted to remain in scarlet fever wards for from 1 to 8 weeks without contracting scarlet fever. On the other hand, 36 out of 168 Dick-positive individuals in direct or indirect contact with the disease contracted it.

Dr. Benson found no indication that immunization of the nursing staff against scarlet fever results in an increase of tonsilitis but has actually found a small decrease. On entering upon duty in the hospital, Dick-positive nurses receive a course of 1,000, 5,000 and 20,000 skin-test doses at fortnightly intervals, but those with strongly positive reactions receive 4 injections, 3 at weekly intervals of 500, 1,000 and 5,000 skin-test doses followed by 20,000 skin-test doses after a further two weeks. Pre-hospital immunization against diphtheria is suggested. Allowing for expenditure on material, diphtheria immunization methods have resulted in a saving of £456 since 1922, and in the case of scarlet fever of £244 during the past 2 years.

A. Job.

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Reviews.

PERCUSSION OF THE CHEST. By L. B. McDougal, M.D., F.R.C.S.E., F.R.F.P.S. London: Lewis and Co., Ltd. 1929. Cr. 8vo. Pp. viii + 143. Price 6s. net.

In these days when many of us are inclined to scamp the routine methods of examining the chest and to seek all too readily the help of the radiologist and bacteriologist, the perusal of such a volume as this acts as a salutary reminder that we are in danger of forgetting a technique we cannot afford to lose. If it did no more than stimulate us to make a fuller use of this method of diagnosis, it would have served us well, but Dr. McDougal has gone further and told how we can so improve our technique that we may increase the possibilities of the method.

A short chapter on the historical facts regarding percussion of the chest is followed by a very clear description of the manner of its performance. The third chapter dealing with the acoustic aspect is very comprehensive; in it are discussed the causation and significance of the varying notes elicited in the different conditions of the thorax. In the last chapter there is a description of the variations in the percussion note in various diseases of the chest.

The volume will satisfy those who wish to amplify the information given on the subject in the various books dealing with methods of clinical examination.

DIABETICS: A MANUAL FOR PERSONS SUFFERING FROM DIABETES MELLITUS. By J. Knowles Lund, M.R.C.S., L.R.C.S., D.P.H. London: Faber and Faber. 1929. Pp. 87. Price 3s. 6d. net.

This little manual is written for the guidance and instruction of persons suffering from diabetes mellitus, and is one which any doctor may place in the hands of such a patient with profit to both. In order to pursue his treatment to the best advantage, there are so many things which a diabetic should know and practise that the busy practitioner must be glad to find a small volume such as this which gives in simple language the information it would take him long to convey.

Sections are devoted to a short description of the disease and the rationale of its treatment, personal hygiene, prevention of coma, dietetic treatment (here very good tables of diets and food values are included), tests for sugar in the urine, weight, insulin and its self-administration, and a few cookery recipes and hints.

It should prove itself a useful little book.

INDIGESTION: ITS DIFFERENTIAL DIAGNOSIS AND TREATMENT. By Herbert J. Paterson, C.B.E., M.C., M.A., F.R.C.S. London: Heinemann (Medical Books), Ltd. 1929. F'cap 4to. Pp. viii + 153. Price 7s. 6d.

Most of us find that the diagnosis of the conditions leading to indigestion is one of the most difficult and common which we have to face. It is of such vital importance that we should come to a definite opinion at an early stage, that we must avail ourselves of every means whereby our knowledge may be widened. There are no more serious problems confronting us than those of diagnosing an early cancer of the stomach, of differentiating a duodenal ulcer from appendicitis or gallstone gastralgia or of discovering some constitutional cause for the gastric symptoms.

The present volume affords us a great deal of help in the matter. Written as a clinical handbook for practitioners, it confines itself wholly to clinical features of the various indigestions and is the fruit of the experience of the author in practice.

The symptoms, differential diagnosis and treatment of each condition are dealt with in detail. The methods suggested for diagnosis are such as any practitioner can carry out, much stress being laid on the use of the stomach tube: the author considers that the practitioner who does not use this to make an analysis of the gastric contents in a case of persistent indigestion is acting unfairly to himself and to his patient. As regards early diagnosis of gastric cancer, the complaint is made that only fifty to twenty per cent of the cases are sent to the surgeon early enough for radical treatment.

In operating for gastric or duodenal ulceration, he invariably removes the appendix as being the site of the primary lesion: he advocates every case of ulcer, except when there has been a hæmorrhage, being given a thorough medical treatment, which failing, operation. The intensive alkaline treatment he does not practise or recommend, nor does he credit the possibility of such rapid healing under this treatment as has been claimed by its advocates. Colectomy for intestinal stasis he regards as unjustifiable from the ultimate risk of obstruction, and "pexies" he condemns.

This is a book that will repay study. It has a good index and is got up in a very attractive manner.

ESSENTIALS OF PHYSIOLOGY. By Bainbridge and Menzies. Sixth edition. Edited by H. Hartridge, M.A., M.D., Sc.D., F.R.S., Professor of Physiology, University of London. London: Longmans, Green and Co. 1929. 8vo. Pp. xii + 497; figs. 192. Price 14s.

Advances in physiology and biochemistry have been so rapid in recent years that although it is only four years since a revised edition of this work appeared, in the preparation of the present edition considerable re-arrangement has been necessary.

New chapters have been written on basic principles, muscle, nerve, the central nervous system, vision, hearing, the liver, exercise and work. New

sections have been added on capillary circulation, the vitamins, and the kidneys, etc. Many old diagrams have been omitted and new ones added. Although, in bringing the work fully up to date, the editor has re-written a considerable amount and added much, he has succeeded, by omitting the redundant, in keeping the volume to the size of previous editions. The familiar form of the book has been retained in this edition and it has gained in clearer typing of the text: the subsections are introduced in thick type, as are the more important references in the index.

Criticism of the volume is easy. It is enough to say that it is as informative as its predecessors were when published, and that it will retain the position they established as a standard textbook for students of physiology.

Synopsis of Midwifery and Gynæcology. By Aleck W. Bourne, B.A., M.B., B.Ch., F.R.C.S. Bristol: John Wright and Sons, Ltd., 1929. Fourth Edition. Cr. 8vo, pp. 434, with numerous diagrams. 15s. net.

The time is not far gone when the use by students of such aids to study as any abbreviated publication was looked on by their teachers as something almost illegitimate. Perhaps it is because it is realized that synopses are nowadays so much better than their predecessors and can relieve the burdened student of much onerous notetaking, that they have now an established position in the medical man's library.

The present volume is a good example of the best type of synopsis, so good that even teachers themselves may find some profit in its use. The information given on each condition and subject is remarkably comprehensive, and, after the revision it has undergone, thoroughly up to date.

The sections on diagnosis and treatment have been rendered as practical as possible—apart from operative details which have been excluded—in order that the work may prove useful to the general practitioner. The medical student will find it a useful supplement to, and substitute for, the ordinary textbooks, for quick revision of the subject.

The small diagrams are clear and helpful, and the indexing is satisfactory.

It is one of the books all of us who are likely to deal with women's complaints should have by us, however limited we may be compelled to make our library.

Cancer. By G. Jeanneney. Translated by J. Gibson, M.C., M.A., M.D., and J. H. Watson, M.B., F.R.C.S. London: Longmans, Green and Co. Pp. xiv + 186. Price 7s. 6d.

One gathers from a perusal of this little handbook that the author's principal aim is to emphasize the importance of making an early diagnosis of neoplastic growths. This diagnosis, he insists, should be attempted by the general practitioner.

Those of us who have had considerable experience in palpating tumours are impressed, as our cases multiply, with the extreme difficulty of making a correct differential diagnosis. At the same time we recognize the dangers associated with the word " cancer " in our patients' psychological make-up.

We are not prepared, on the other hand, in view of Bloodgood's paper on chronic mastitis, to accept the author's sweeping statement that this condition becomes frequently converted into a carcinomatous process.

In 222 cases out of a series of 350, in which the entire breast was removed and studied, not one single case showed gross or microscopic cancer. If the further object of the book is to give practical pathological information of value to the general practitioner, the grouping of myeloma and myeloid sarcoma as a single entity is surely against the modern view, which indicates that myeloid sarcoma is a well-defined group of neoplasms whose most characteristic histological feature is the presence of multinucleated, more or less centrally placed, giant cells, and whose malignancy is doubtful; while on the other hand, the term myeloma is limited to a group of cases in which numerous simultaneous growths develop in the bone marrow, and is associated in a considerable percentage with a specific type of albumosuria.

With regard to the chapter on treatment, both by surgical and ray therapy, no one will deny that though this is of great interest, such treatment must of necessity remain in the hands of the specialist.

J. H. M. F.

ALCOHOL AND HUMAN LIFE. By C. C. Weeks, M.R.C.S., L.R.C.P. Foreword by Sir Thomas Barlow, Bart. London: Messrs. H. K. Lewis and Co., Ltd. 1929. Pp. x + 201. Price 3s. 6d. net.

Dr. Weeks states that, after revising the last edition of "Alcohol and the Human Body" by the late Sir Victor Horsley and the late Dr. Mary Sturge, he found that the cost of publication would place it beyond the reach of the average social worker. He therefore published this volume which represents the salient revision of certain facts and figures with some additional matter: it brings up to date Horsley's book and gives those who do not possess a copy of that work many facts worthy of consideration.

The author collects evidence from many diverse sources, such as Registrar-General's Returns, Crime Records, etc., showing the effect of alcohol on the human, both directly and indirectly. Chapters are devoted to its incrimination as the cause of many diseases and social evils. Everything goes to show that in every way alcohol is a poison and that in no circumstance can it do any good. Even our belief that alcohol is to some extent a food is shattered. Many tables of statistics are introduced from which the conclusions are largely drawn.

While the impartial critic will consider that in several cases conclusions are drawn on unsatisfactory or insufficient grounds, he cannot help being

impressed by the mass of evidence adduced against alcohol, and by the comparative moderation with which it is presented.

It is a book that deserves a wide circulation.

CATALOGUE OF LEWIS'S MEDICAL AND SCIENTIFIC LIBRARY. London, 1928. Pp. 576. Price 15s. net.

The new edition of Lewis's Catalogue revised up to the end of 1927 has just appeared. The Library was established in 1848, to supply mainly the needs of members of the medical profession, and to lend out books of scientific or philosophic interest not to be found in the ordinary circulating libraries. The catalogue consists of two parts. In Part I the names of the authors and the full title of each book are given. There are 408 pages in this section.

In Part II there is an index of subjects. The initials of authors are given to facilitate reference to the body of the catalogue. The year of publication of each work is also mentioned, and a word or two has been added to indicate the nature and scope of the book.

The catalogue cannot fail to be of service to medical men and to research workers.

ARMY HEALTH IN INDIA—HYGIENE AND PATHOLOGY. By Lieutenant-Colonel John Mackenzie, M.A., M.B., Ch.B., D.P.H. With a foreword by Lieutenant-General Sir Matthew Fell, K.C.B., C.M.G., F.R.C.S., K.H.P., Director-General, Army Medical Sesvices. London: John Bale, Sons and Danielsson, Ltd. 1929. Pp. 158. Price 10s. 6d.

The title of this book might suggest masses of figures and graphs which are of more interest to the statistician than to the average reader, but this is far from the case for the author has produced a most readable little volume which holds one to the very last page. It is divided into six chapters entitled—"The Health of the British Troops," "Malaria," "Organisation," "Research," "Cantonments," "Conclusion," and contains numerous graphs and illustrations which greatly assist the text.

Those of us who have never sat and baked under a pitiless sun in the plains are inclined to think only of the splendour of the East, the bright colours, and brilliant pageantries; but there is another India not quite so well known that we only get an occasional glimpse of when the veil is raised. Every now and then a book like "Mother India" appears and for a moment Mayfair sees India as it is, stripped of all its trappings, and wonders how such things can exist, but it is soon forgotten, for after all it is many thousands of miles away!

Colonel Mackenzie begins by reviewing the work of the Royal Commission appointed in 1859, by Queen Victoria, up to which time statistics dealing with the health of the troops were unreliable if indeed available.

The terms of reference of this Commission were extensive and comprised the following:—

(1) An inquiry into the rate of sickness, mortality, and invaliding among the troops at all stations.

(2) An inquiry into the cause of such sickness and mortality.

(3) An inquiry into which stations are unhealthy, and how such conditions can be removed.

(4) An inquiry into the subject of healthy positions generally as well as sanitaria and hill stations.

(5) An inquiry into the best construction of barracks, huts, hospitals, tents, etc.

(6) An inquiry into the present regulation or practice for preserving the health of the troops.

(7) An inquiry into the present organization of Army Sanitary and Medical Services.

(8) An inquiry as to the practicability of establishing a general system of statistics throughout India which should include a comparison between diseases affecting the Civil and Military populations.

(9) And finally to report on what changes it is expedient to make in the present practice with regard to any of the above-mentioned subjects.

The work of this Royal Commission was carried out with the greatest thoroughness and occupied four years, and had the most striking immediate results, for while the death-rate (exclusive of men killed in action) in 1838 was 59 per 1,000 in 1860 it fell to 32·5.

The conditions they had to compete with were appalling, as the following extracts from the Royal Commission's Report which are quoted by Colonel Mackenzie will show.

"The present buildings have been condemned . . . no drainage . . . no means of washing or drying linen . . . all the fluid refuse soaks into the ground where it falls . . . a foul ditch surrounds the fort . . . no stables for mounted troops . . . no quarters for married men, the married people occupy barrack-rooms with the men but separated by tatties." "The bazaar is an accumulation of huts without any attempt at order, the drainage is bad, the ventilation worse; water supply execrable, all the wells are brackish with nitre oozing into them from the surrounding earth which is contaminated with all sorts of impurities, tanners' refuse included. Latrines are hardly known; in short, the bazaar is a mass of filth!" Such was the India of the Lawrences.

In 1861, Mian Meer (Lahore Cantonment) had a cholera death-rate of 352·75 per 1,000 while that of Amritsar, a few miles away, was 124·05; with these figures there is little wonder that the Royal Commission recommended that properly trained Army Medical Officers of Health should be appointed at the larger stations.

When referring to the lighting of barracks the Royal Commission remarks on the inadequacy everywhere, and a footnote states "There is now authority given to light the barracks with kerosene oil," and Colonel Mackenzie naïvely adds in another footnote, "Many of the British barracks in India are still lighted with the kerosene lamps of 1865!"

In 1898 the "Army Medical Staff" became the "Royal Army Medical Corps" and in this year the admission rate stood at 1,423, which may be considered about the average. In the following year there was a phenomenal drop to 1,148·7 per 1,000, a ratio never since that time even approached.

The following disease groups account for more than half the total admissions in these two years, malaria, venereal disease, diseases of the digestive system, enteric fevers, and of all these malaria heads the list.

In the chapter on "Malaria," there is an interesting map entitled "The Moloch's Kingdom—Malaria astride the World," which shows the distribution of this disease in both the Eastern and Western hemispheres. It is not always perhaps realized that in India alone 100,000,000 are attacked every year by this disease, while it takes an annual death toll of from one and a half to two millions, and Colonel Mackenzie asks "Can plague, or cholera, or war do this?"

The author points out that diseases caused by biting insects are the most important military hygiene problem in India.

A résumé is given of the methods for dealing with malaria, of which "cold storage" holds out the greatest possibilities; this consists of removing troops to the hills from malarious stations during August, September and October. During 1927 this practice led to a fall in the admission rates from 165·3 per 1,000 in 1926 to 138·8 in 1927.

Apparently the mosquito proofing of some of the barracks is being held up for lack of funds, which appears to be a very short-sighted policy.

The sanitary organization is fully discussed, and its growth traced from 1898 up to the reorganization in 1925, when a Deputy Assistant Director of Pathology was appointed to each of the fourteen districts with charge of a district laboratory, and a graph shows the hygiene and pathology organization of the Army in India in 1928.

The chapter on "Research" is a most interesting one, and gives some idea of the immense amount of work which has been going on quietly behind the scenes and is now bearing fruit.

Colonel Mackenzie speaks in glowing terms of the value of the investigations carried out by McCombie Young and Richmond on sandfly fever; of that of Manifold, Little, and Large on dysentery; of Covell and Grant on ankylostomiasis.

The description of Cantonments is one of the best chapters in the book, and contains extracts from the observations of Florence Nightingale as to the condition existing in her time, and just to show that even now everything is not well, the writer puts in the following extract from a sanitary report of 1925: "There are no urinals in the bazaar, with the result that people urinate into the drains. Children are defæcating on the ground round this latrine, which was therefore in a filthy condition, and residents near by are complaining of the bad smell."

All this is very disquieting reading and calls for urgent measures. Colonel Mackenzie considers that the Cantonments Act of 1924 needs

"alteration and amplification as regards health administration to render it practical and workable." He considers that the health organization in a Cantonment should be under the Health Officer in a central health office, and that clerks and sanitary inspectors should be placed at his disposal. Further, the A.D.M.S. of the district, assisted by the D.A.D.H., if any, should have control over the health organization in Cantonments in his district, and that the D.D.M.S. of the Command should have super control, and that the whole organization throughout India should come under the general supervision of the D.M.S. at Army headquarters. At least, Colonel Mackenzie cannot be accused of merely destructive criticism, for here are constructive proposals for the improvement of a system which apparently needs it.

In his concluding remarks a very reasoned résumé is given of the work that has already been done, as well as of that which requires immediate attention. He considers that the most urgent problems are the prevention of malaria, venereal diseases, dysentery, dengue and sandfly fever.

The writer demonstrates forcibly the economic side of the present sick wastage in India, and points out that in five years the expenditure on maintaining in hospital the percentage of sick in excess of that at home is £2,000,000, and with every justification suggests that if a fraction of this sum was spent over a similar period on approved health measures it would bring the hospital admission rate down to approximately the home level. Lastly, the book contains a summary of the conditions responsible for the high admission rate, and a series of recommendations, some of which might well be adopted.

In producing "Army Health in India," Colonel Mackenzie has performed a public service, and is to be congratulated on a fearless exposure of a very unsatisfactory state of affairs which call for some remedy, though it is fully realized that the difficulties to be surmounted are enormous.

The whole problem is governed by finance, and at the moment some of the best brains in the profession, often working under the most trying conditions, are sadly hampered for lack of funds in the fight against disease.

It is therefore hoped that this book may be read when the next annual estimates are in preparation and, indeed, a copy might well be sent to those most closely concerned.

Correspondence.

THE WHITE MAN'S GRAVE IN THE EIGHTEENTH CENTURY.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

DEAR SIR,—Concerning Colonel Storr's article in the Journal for September, 1929.

Those of your readers who have neither time nor opportunity to read old medical works may be interested to know that the "dry belly-ache" was

not exactly a coast disease, but a toxic condition, to wit "lead colic." The disorder prevailed in places where beverages, such as rum for instance, were stored in leaden vessels or in containers having leaden pipes. Old West Indian writers recognized lead as the cause of the complaint among soldiers under their care.

"Tetanos" and "malignant nervous fever" defeat me. Tetany and malarial fever were not like that in my time.

Bad diet, bad housing among the natives (down in the flats in what is still called Soldier Street, for instance, in Freetown), bad water, and spirit drinking must have complicated all maladies. Think of salt beef and rum on the coast. And there was always a chance of a dose of some native poison.

There was no going home on leave in those days.

Guinea-worm was very much a white soldier's complaint in the good old times, even in India. It was the Connaught Rangers, I think, who embarked at Bombay for Abercrombie's trip to Egypt with more than 200 cases. That was some fifteen years after Mr. Colbery's experiences.

Let us give thanks that we were born later. But even when I first went to the coast there was no regular supply of either ice or soda water; we lodged in the town, and the waterworks had not been constructed. Withal we were happy enough, and each of us, in the R.A.M.C. way, tried to make the place a little better for the next comers.

I am, etc.,

FRED. SMITH,

Colonel, late R.A.M.C.

Notice.

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WE have received from Messrs. Burroughs Wellcome and Co. a new product described as "Tabloid" Alkaline Compound, Effervescent, for use in disturbed acid-base equilibrium.

The formula is: Sodii bicarbonatis, 5 gr. (0·324 grm.); calcii lactophosphatis, 3 gr. (0·194 grm.); potassii bicarbonatis, 1 gr. (0·065 grm.); magnesii sulphatis anhyd., 1 gr. (0·065 grm.); sodii chloridi, 1 gr. (0·065 grm.); salis effervescentis, q.s.

This alkaline compound may replace the usual alkaline diuretics in fever and acute infections and also the imperial drink in chronic renal conditions. It is of benefit in gout during the paroxysm and in the various chronic manifestations.

The firm have issued for distribution to the medical profession a booklet in which the mechanism, significance and treatment of acidosis are discussed.

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The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc.

Correspondence on matters of interest to the Corps, and articles of a non-scientific character, may be accepted for publication under a nom-de-plume.

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Journal
of the
Royal Army Medical Corps.

Original Communications.

THE PHYSICAL AND CHEMICAL ANALYSIS OF GLASS AND RUBBER USED IN THE MEDICAL SERVICES.[1]

By Surgeon Commander F. LEWIS SMITH,
Royal Navy,
and
Mr. F. HOOPER, M.B.E.,
Head Pharmacist, and Technical Assistant to the Medical Director-General of the Royal Navy.

For the purpose of this paper the question of "Glass in Medicine" is restricted to the durability and suitability of glass bottles, ampoules, etc., for holding drugs and chemicals used in the medical profession.

Glass is such a universally employed commodity that a short historical note thereon is not without interest. It was first made by the Egyptians, probably about 2000 B.C. The ancient Assyrians were also versed in the manufacture. Coming to later dates, Pliny (*Nat. History,* xxxvi, 26-66) tells us no glass compared to that of Indian manufacture. China, with its ancient civilization, did not adopt glass readily, no doubt due to the fact it possessed the secret of making such wonderful porcelain. The knowledge of the making of glass is thought to have reached China via Ceylon. In the Roman era the process of manufacture was undoubtedly learnt from the Greeks of Constantinople, and very soon we learn, the Romans had mastered the art of making transparent glass, coloured blue, green, amethystine, purple, amber, rose. etc., whilst their opaque glass was

[1] Paper read before Fifth International Congress of Military Medicine and Pharmacy.

coloured white and black, blue, yellow, green and orange. In the mediæval period France was the country *par excellence* in the realms of glass making. Since that period, as is well known, the manufacture has become a wide-world industry.

That the scientific knowledge of the chemical constituents of glass, and the factors which control the production of a glass of good quality, were available more than fifty years ago is shown by reference to the details of the analysis of glass by Grus, Berthier, Dumas and others, quoted in Ure's *Dictionaries of Chemistry*, 1858 and 1878. Studying the works of these pioneers one comes to the conclusion that the knowledge was available but the application thereof was not made use of to the extent desirable.

The following remarks from Ure's *Dictionary* might have been extracted from any modern textbook on Glass Technology: "The harder and more infusible a glass is, the less it is alterable by the action of the atmosphere and chemical agents with the exception of hydrofluoric acid. Glass which is too alkaline attracts, gradually, the moisture of the air and loses its lustre and polish; many glasses are perceptibly attacked by prolonged boiling with water. . . . The power of glass to resist the action of water, etc., is in general the greater the higher the temperature employed in its manufacture and the smaller the proportions of fluxes and the more exact the equivalent ratio of its constituents. When glass contains too much alkali it is partially soluble in water."

In spite of such information being given to glass manufacturers, glass continued to be made largely by "rule of thumb," the glass makers depending on experience only, sometimes with happy, but often with results which were far from perfect.

It was not uncommon for bottles, particularly those of colourless glass, to devitrify within a few weeks of manufacture. Again, even when the glass did not become full of cracks, a marked efflorescence and/or a "slippery" moisture formed on the surface according to whether soda or potash was the alkali in excess. Such glass was unsuitable for the purpose of storing medicines.

In addition to the lack of scientific knowledge and control, it would appear that two further factors were at work to bring about these undesirable results:—

(A) The glass furnaces were inadequately heated; consequently, if a batch refused to melt rapidly, an excess of alkali was deliberately added to act as a flux. Further, a "soft" glass was more easily worked than one of a higher "resistive" character, especially when used by lamp-workers for the manufacture of ampoules, etc.

(B) A "soft" glass would enable a workman to turn out quite 25 per cent more than would be the case if employed on a "resistive" glass. Combined with this—to him an economic factor—was the certainty of a smaller loss from breakages.

Much has been written about the chemical analysis, such as the ternary

DETAILS OF TESTS ON BOTTLES USED IN THE ROYAL NAVAL MEDICAL SERVICE BETWEEN 1885 AND 1928.

These bottles are old sealed patterns, and the date of sealing is approximately the date of manufacture. For the purpose of comparison they have been subjected to Kroeber's Narcotine Test and that of the German Pharmacopœia, for the first hour in boiling water then standing for twenty-four hours at room temperature.

Description	White stock	White dis-pensing	White stock	White stock	White chest	Amber stock	White stock	White dis-pensing	Dark blue chest	Medical tint dis-pensing	Resist-ance flask	
Date	1885	1891	1889	1904	1905	1910	1916	1926	1928	1928	1928	
Narcotine Test.												Narcotine Test
Time— 10 minutes	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	Very heavy	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	
20 minutes	*Nil*	*Nil*	*Nil*	*Nil*	Trace	*	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*	
45 minutes	*Nil*	*Nil*	*Nil*	*Nil*	Marked	*	Trace	*Nil*	*Nil*	*Nil*	*Nil*	
1 hour	Trace	*Nil*	*Nil*	*Nil*	Incred.	*	Marked	*Nil*	*Nil*	*Nil*	*Nil*	
24 hours	Marked	Trace	*Nil*	Trace	Very heavy	*	Heavy	Marked	Trace	Trace	*Nil*	
German Pharmacopœia Test.												German Pharma-copœia Test
Time— 15 minutes	*	‡	§	§	†	*	‡	‡	§	§	§	
30 minutes	‡	‡	§	‡	*	*	†	‡	‡	‡	§	
1 hour	‡	‡	§	‡	*	*	*	‡	‡	†	§	
24 hours	†	‡	§	‡	*	*	*	‡	‡	‡	§	
Remarks	**Fair**	**Good**	**V.G.**	**Good**	**Bad**	**V. bad**	**Poor**	**Good**	**Good**	**Good**	**V.G.**	

Red. Colour of methyl red. * Gone. † Faint. ‡ Reduced. § Apparently unaltered.

system, Na_2O, CaO, SiO_2, but it is not proposed to deal with this aspect of glass technology. This aspect has been carefully dealt with by Gelsthorp and Parkinson and others [1], and, as previously stated, it is our intention to examine the subject from a medico-pharmaceutical aspect.

The specifications for glass bottles, measures, etc., used in the Royal Naval Medical Service was closely investigated by the officer in charge of the Royal Naval Medical Depot, Deptford, who in 1888 introduced into the conditions of contract a clause requiring the glass to possess a high lead-content—in reality, to be similar in character to crystal glass tableware. This, however, caused so much trouble to the contractors that it was dropped in 1905, when ordinary commercial articles were accepted. The immediate result was a crop of bad bottles as shown in the preceding table.

No records are available of any deliberate tests having been carried out on the durability of the older bottles. There does not appear to have been any complaints of the precipitation of alkaloidal solutions stored in them. Some of the "stock" bottles in our Naval dispensaries are many years old, and these, when freshly cleaned, are the acme of clear lustre. It proves that these bottles were made of good durable glass, and, further, when tested by the narcotine test or by that of the German Pharmacopœia, these old bottles compare favourably with those of recent manufacture. Indeed, a white glass stock bottle (S.G. 3·04), dated 1889, shows only a very few needles of narcotine after standing twenty-four hours following the one hour's immersion in boiling water, even standing the test as well as a boiling flask, dated 1928, of special resistance glass.

Complaints regarding the quality of bottles, however, were of frequent occurrence after 1905 and continued until the great improvement which has taken place during the past few years, following upon the more general introduction of gas-fired furnaces and the scientific control of factories engaged in glass manufacture.

British manufacturers are now making bottles of good quality for general purposes, whilst the "resistance" glass turned out by the members of the British Chemical Ware Manufacturers' Association is of exceptional quality and is therefore superlative for the manufacture of ampoules, bottles, etc., intended to contain solutions of alkaloids and other drugs sensitive to traces of free alkali.

On the other hand, bottles of bad quality have been found in use. Richmond [2] reported that potassium carbonate, originally containing less than five parts of lead per million, after storage in a glass bottle for nine weeks contained 150 parts per million. Another sample of the same chemical, after storage in a similar bottle, contained ten parts of arsenic and eighty parts of lead per million. A sample scraped from the side of the bottle contained twelve parts of arsenic and 500 parts of lead per million.

It is obvious that the use of such bottles should be prohibited. Consequently, it is highly desirable that some standard tests should be adopted to ensure that the glass containers are of such a constitution that they do, and will not injure the drugs or chemicals stored therein.

The test should be of such a nature that it can be rapidly and easily applied, using the ordinary appliances to be found in a pharmacy. This test should be also somewhat of a quantitative nature in order that the containers may be approximately assorted into three groups or classes, e.g.:—

(A) Bottles and ampoules of highly resistive glass for hypodermic solutions and other medicines liable to deteriorate in the presence of traces of free alkali.

(B) Stock and medicine bottles for ordinary drugs and chemicals.

(C) Those which are not suitable for use in either of the former categories.

Further, it is essential that mechanical defects should receive careful consideration; excessive brittleness and the presence of bubbles, especially the latter, are objectionable faults. A bubble near the inner wall of a glass container is liable to break and contaminate the contents with sharp flakes of glass or it may form a pocket from which it is very difficult to remove dirt or remains of the former contents.

At first sight the practical test of glass vessels would appear to be very simple, arguing that it is only necessary to place in them some of the materials they are intended to contain, and then store them under normal conditions for a certain period.

Medicines, however, are so many and varied, the deterioration of them due to the glass-container is frequently so insidious that it is quite impracticable to consider such a test as being of any value. It could *not* be carried out within a "reasonable period of time." No matter how slow the process of deterioration may be, it cannot be ignored, especially with regard to glass bottles and containers used in ships. Such containers may have to store drugs, etc., for a lengthy period under many variations of climate and temperature. It is therefore essential that the drugs they contain should be in good condition when required for ordinary use or emergency.

It has been the custom to test the suitability of the ampoules used in the Royal Navy for hypodermic solutions, and the special bottles for morphine solution, etc., by subjecting them, filled with their proper solutions, to heat in an autoclave for one hour at one atmosphere pressure. If no precipitation or other apparent change has taken place at the end of that period, the glass was considered to be of good quality, and as such acceptable for this purpose.

A study of the literature devoted to glass technology shows that a great deal of research work has been, and is being performed in the testing of glass durability and devising formulæ calculated to produce good durable glass under the everyday conditions of the ordinary glass works. Fortunately for our profession such research work is international at the present time.

With the exception of the action of strong solutions of caustic alkalis, the results seem to point to the fact that the action of water in an autoclave at two atmospheres pressure for thirty minutes is a fair indication as to

the durability of the glass for storing medicines at normal temperature and pressure for indefinite periods. It must be remembered, however, that the temperature at which the test should be made, the most suitable indicator, and the means of estimating the amount of hydrolysis which has taken place, are still subjects for debate. Phenolphthalein, methyl orange, methyl red, iodeosin and various solutions of alkaloid salts have been suggested as indicators. The temperatures recommended have varied from exposure to moist air at room temperature to treatment in an autoclave at twelve atmospheres pressure.

For optical glass the iodeosin test appears satisfactory, so much so that it has been accepted as a "standard" test. A freshly fractured surface is immersed in an aqueous ether solution of iodeosin for one minute at 18° C. Any alkali set free will combine with the iodeosin to form a red salt ; this, being insoluble in ether, is deposited upon the surface of the glass. The test piece is then washed with pure ether to remove excess of dye. The iodeosin salt is next dissolved in water and the amount estimated colorimetrically. The test is repeated on another piece which has been exposed to the atmosphere for seven days after fracture to estimate the "weathering" of the glass. The test has been described thus briefly chiefly for its academic interest, as it does not appear to have been generally accepted for bottles and ampoules, probably because it is essential to have a "weathering" test.

The German Pharmacopœia gives the following tests :—

Medicine Glasses.—The glass container is to be three-quarter filled with an aqueous solution of hydrochloric acid containing one c.c. of N/10 HCl and five drops of methyl red solution in 1,000 c.c. The vessel is to be heated for thirty minutes in a bath of boiling water. After this time the red colour should not have completely disappeared.

Ampoule Glass for Solutions of Alkaloidal Salts.—Five grammes of the coarsely-broken ampoule glass with 100 c.c. of water, 0·3 c.c. N/100 hydrochloric acid and one drop of methyl red solution are to be heated for half an hour in a flask of Jena glass which has been previously boiled out with distilled water. After this time the red colour of the solution should not have completely disappeared.

Peddle [3], by determining the number of milligrammes of sulphuric acid needed to neutralize the filtrate after boiling 100 grammes of glass in 160 powder for one hour in distilled water obtained values concordant with those obtained by actual "weathering."

The actual test is the mean of two determinations made on five grammes of glass multiplied by twenty to give the "sulphuric acid value" for 100 grammes of glass. The glass is powdered in an agate mortar and the heating carried out in a platinum vessel. A "sulphuric acid value" of 100 represents a highly resistant glass. That over 600 represents an inferior glass.

Such apparatus as agate mortars, platinum vessels or autoclaves are not generally available, except in well-equipped laboratories, and we suggest

that on the whole the narcotine hydrochloride method suggested by Kroeber [3A] in 1914 appears to be a very satisfactory test in that it fulfils the requirements of being quickly and easily applied, and, further, it calls for no very special apparatus and great technical skill is not essential to obtain practical qualitative results.

Blackmore, Dumberley and Turner [4] made a careful examination of this test, and confirmed that it gave good concordant results.

Professor W. E. S. Turner, D.Sc., M.Sc., Head of the Department of Glass Technology, the University of Sheffield, has very kindly furnished us with the exact details of this test as used by him for several years, together with Tables I, II, III, IV, and V. He has also supplied us with the details of another test depending on the estimation of the amount of alkali extracted by boiling water under certain conditions. With regard to this latter test, a discussion is now taking place between the British Society of Glass Technology and the Deutsche Glastechnische Gesellschaft in an endeavour to set up a common standard.

A modification of this test is proposed, but Professor Turner suggests that it can well be adopted as an interim test, whilst, on the other hand, the narcotine hydrochloride test is particularly applicable to glass intended to contain solutions of alkaloids or other solutions sensitive to traces of alkali derived from the glass container.

Durability Tests on Samples of Glass Tubing used for Making Ampoules (Turner).

(1) *Qualitative Test, using Narcotine Hydrochloride. Particulars of the Method of Testing.*—A solution of narcotine hydrochloride is prepared by dissolving one part of the material in 1,000 parts by weight of hot distilled water. The solution MUST be made in new resistance glass vessels or a deposit may be formed at once. The tubing to be tested is then sealed at one end so as to form a test tube, then it is washed thoroughly with water, very dilute acetic acid, and finally with distilled water and alcohol to assist in drying. After thorough drying in the oven, the tube is suspended in a bath of boiling water; the narcotine hydrochloride solution is brought to the boil; it is poured in so as to fill the tube within about 1½ inches from the top, the whole of the narcotine solution column being below the surface of the water in the bath. The mouth of the tube is closed by a plug of cotton-wool.

Heating in the water bath at the temperature of boiling water is continued and the appearance of the solution noted from time to time, until sixty or ninety minutes have elapsed. If a cloudy precipitate appears within ten minutes the glass is of unsatisfactory quality; if a precipitate begins to form after ten minutes and increases during an hour, the glass is not sufficiently good to contain alkaloidal solutions. If a few minute needles appear in fifteen to twenty minutes, but do not increase distinctly in an

hour, the glass is satisfactory, while no deposit indicates a glass of good resistance.

In carrying out the test care should be taken that the water in the bath in which the various tubes are immersed is at the boiling point, and that the temperature is reasonably uniform at all points of the bath.

(2) *Quantitative Boiling Water Test, using Powdered Glass. Particulars of the Method of Testing.*—The glass to be tested is ground so as to pass a sieve of mesh No. 20, and to lie on sieve No. 30 of the standard sieves of the Institute of Mining and Metallurgy. The glass-powder is blown free of adhering fine dust by means of compressed air, then ten grammes are weighed into a small cylindrical platinum mesh bag of No. 90 mesh. The bag is agitated in alcohol so as to wash out all remaining fine particles and dust; the bag and glass are then dried in an air oven at a temperature of about 110° C., and after cooling the whole is re-weighed.

TABLE I.—SUMMARY OF THE RESULTS OBTAINED ON BRITISH GLASSES IN THE QUALITATIVE TEST, USING NARCOTINE HYDROCHLORIDE.

Designation and type of glass	Result of test	Verdict
A. Resistant	No trace of deposit in 1½ hours	Very good quality
B. Neutral ampoule ..	,, ,, ,, ,, ...	,, ,,
C. Colourless soda ..	Slight deposit in 10 minutes increasing during an hour	Unsatisfactory as container for alkaloids
D. Amber	No trace of deposit in 1½ hours	Very good
E. Colourless	,, ,, ,, ,, ...	,,
F. Neutral soda ..	,, ,, ,, ,, ...	,,
G. Colourless soda ..	Slight deposit in 15 minutes increasing during an hour	Unsatisfactory as container for alkaloids
H. Amber	No trace of deposit in 1½ hours	Very good quality
I. Blue..	,, ,, ,, ,, ...	,, ,,
J. Green	,, ,, ,, ,, ...	,, ,,
K. Mauve	,, ,, ,, ,, ...	,, ,,

TABLE II.—SUMMARY OF THE RESULTS OBTAINED IN THE QUANTITATIVE TEST, USING POWDERED BRITISH GLASSES.

Designation and type of glass	Percentage loss in weight in grammes	Percentage alkali extracted as Na_2O	
		Free	Total
A. Resistant..	0·011 ..	— ..	0·007
B. Neutral ampoule tubing ..	0·014 ..	— ..	0·007
C. Colourless soda	0·116 .	0·01 ..	0·041
D. Amber	0·013 ..	— ..	0·007
E. Colourless	0·008 ..	— ..	0·004
F. Neutral soda	0·025 ..	— ..	0·006
G. Colourless soda	0·096 ..	0·01 ..	0·050

500 c.c. of distilled water are brought to the boil in a large silica beaker fitted with a silica dish, through which cold water is kept flowing so as to act as a condenser, preventing any loss of steam from the beaker. The bag and glass are suspended in the boiling water, which is then boiled for one hour. The bag is removed and well washed in warm distilled water, then

the bag and its contents are dried in the oven again, cooled and re-weighed. The percentage loss in weight of the glass is calculated.

The solution in the silica beaker is cooled, and titrated against standard sulphuric acid solution N/100 strength, using methyl orange as indicator to determine the total alkali extracted from the glass.

The percentage Na_2O extracted from the glass is calculated from the titration value.

Tables I and II are the results of a series of tests based on the two standard methods described in order to furnish a review of British-made glass supplied for ampoules.

It should be noted that with the exception of two glasses definitely designated as soda glasses, all the remainder are perfectly satisfactory as containers of alkaloids. One of the colourless soda-glasses is specifically stated by the manufacturers who supplied it to be unfit, and not intended, for the storage of alkaloids, but that it was satisfactory for vaccines. Probably the other soda-glass is to be regarded as being of a similar character.

The following Tables—III, IV and V—are extracted from a paper on "An Attempt to Improve the Qualities of Glasses intended for Lamp-working Purposes," presented by Professor Turner on behalf of a joint committee of the Glass Research Association [5], and the same committee [6] has set forth a specification (based on the quantitative boiling water test) for glass intended for general lamp-working purposes as follows:—

"For general purposes no glass should be accepted which sustained a loss in weight of more than 0·30 per cent, or gave up more than 0·1 per cent alkali. For a good glass, however, the loss in weight should not exceed 0·20 per cent, and the alkali extracted not more than 0·075 per cent. We should regard this applicable to glasses for general purposes, including ampoules for vaccines. The requirements should, however, be rather more stringent for solutions of alkaloids, and we should put the limit at 0·07 per cent loss in weight and 0·03 per cent alkali extracted."

Perhaps the great amount of research work being done on the composition of glass in relation to its durability will enable specifications to be laid down for types of vessels intended to contain medicines. There will, however, always be the temptation for glass workers to use "soft" glass, since this enables them to turn out the greatest number of articles with the minimum of labour. Further, it would be impractical to make a detailed analysis of every batch of bottles or ampoules purchased. The application, however, of a simple and efficient test would quickly cause the inferior article to disappear from the market.

We are further of the opinion that there should be an international standard brand or mark on all glassware used in medicine. Such an international mark would be generally recognized as being a guarantee of the quality of the articles stamped therewith. Thus it follows that an agreed-upon test or tests should be adopted and admitted to the national pharmacopœias.

TABLE III.—GLASS COMPOSITIONS (BY ANALYSIS).

Glass No.	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	MnO	ZnO	K_2O	Na_2O	B_2O_3	As_2O_3	SO_3	TiO_2	Total	Total K_2O and Na_2O
G.R.A. 1 ..	67·16	5·13	0·07	6·11	1·27	—	—	5·34	14·42	0·42	Trace	Trace	0·05	99·92	19·76
,, 2 ..	67·74	5·48	0·07	6·16	1·18	—	—	5·10	14·60	0·40	—	—	—	99·75	19·70
,, 3 ..	66·93	5·39	0·07	6·11	0·90	—	—	5·12	14·84	0·50	—	—	—	99·86	19·96
No. 373 ..	67·68	3·90	0·08	6·78	0·22	—	—	6·40	14·22	0·37	—	—	—	99·83	20·62
G.R.A. 4 ..	67·46	5·27	0·09	6·28	0·26	—	—	5·84	14·34	0·32	—	—	—	99·86	20·19
,, 5 ..	66·64	5·87	0·05	6·10	0·63	—	—	5·07	15·35	0·35	—	—	—	100·06	20·48
,, 6 ..	67·62	5·16	0·08	6·23	0·94	—	—	5·00	14·85	0·28	—	—	—	100·16	19·85
,, 7 ..	68·16	4·27	0·06	6·48	0·71	—	—	5·32	14·57	0·22	—	—	—	99·79	19·89
X.	69·43	4·46	0·16	6·41	Trace	0·14	—	7·15	12·21	—	—	—	—	99·96	19·36
J.	68·33	3·15	0·10	6·42	3·50	—	0·81	2·34	13·06	1·98	Trace	Trace	0·05	99·76	15·40

TABLE IV.—DURABILITY OF THE GLASSES AS TESTED BY NARCOTINE HYDROCHLORIDE SOLUTION.

Glass No.	Result of test	Verdict
G.R.A. 1	No deposit in 1 hour	Very satisfactory
,, 2	,, ,,	,,
,, 3	,, ,,	,,
,, 4	,, ,,	,,
,, 5	,, ,,	,,
,, 6	,, ,,	,,
,, 7	Few fine crystals in 1 hour	Satisfactory
370	,, ,,	,,

TABLE V.—DURABILITY AS TESTED BY ACTION OF BOILING WATER FOR ONE HOUR ON POWDERED GLASS (TURNER).

Glass No.	Loss in weight	Total Na_2C extracted	Remarks
G.R.A. 1	0·153	0·044	In all cases a fine sediment was left in the solution, but the surface of the glass particles was clear
,, 2	0·188	0·065	
,, 3	0·214	0·068	
,, 5	0·234	0·068	
,, 6	0·175	0·071	
,, 4	0·236	0·076	
,, 7	0·300	0·087	
No. 373	0·350	0·106	
X.	0·128	0·019	
J.	0·106	0·029	
U.	0·155	0·031	
R.	0·262	0 031	
Q.	0·276	0·031	
W.	0·298	0·031	
Z.	0·230	0·071	
V.	0·258	0·079	
S.	0·299	0·104	
Y.	0·350	0·112	
T.	0·382	0·131	

The writers wish to record their extreme gratitude to Professor W. E. S. Turner, D.Sc., M.Sc., Head of the Department of Glass Technology, Sheffield, and to Mr. Douglas Baird, President of the British Society of Glass Technology, for their invaluable assistance in the compilation of this section of the paper.

Rubber.—The word "rubber" is used in this paper to denote soft vulcanized rubber as distinct from hard vulcanized and raw rubber. It should be borne in mind that the invention of the process of vulcanization of crude rubber made the use of this commodity possible in our science.

Rubber articles used in the Medical Services are the most difficult to test of any articles that the medical storekeeper has to deal with. Even when their condition on receipt from the manufacturer, both in their behaviour towards physical and chemical tests, appears to be perfect, that is no guarantee they will not become useless in a short period of time.

The time at our disposal is so short that it is quite impossible other than to touch on the fringe of this subject.

The difficulties of the subject are many, since tests carried out on the articles made from the same formula vary enormously in tensile strength and their reaction to ageing tests. For example, a series of samples recently

prepared by different manufacturers to the same formulæ showed no relation to each other in their physical properties, although there was little to distinguish them by chemical analysis.

Ageing of Rubber.—At least three types of changes take place in the ageing of rubber: (*a*) Oxidization; (*b*) colloidal modification, which may include both aggregation and disaggregation; and (*c*) after-vulcanization. Of these, oxidization is the most important aspect.

Internal Factors affecting the ageing of rubber.—Some rubbers during vulcanization attain a maximum tensile strength which is sharply defined; others have a flat strength/time of cure curve. If a rubber attains maximum strength quickly at a lower vulcanization coefficient it is anticipated it will age well. The state of cure is most important. Over-cured rubbers age badly and deteriorate rapidly. The introduction of certain dyestuffs greatly retards attack by light.

External Factors such as heat, light, tension, size and shape, various chemical agents, which attack rubber, especially O_2, have to be considered in connection with this aspect. Humidity also has to be borne in mind, for dry air and heat are more deleterious than wet air and moist heat, therefore rubber should be stored in the dark and in a damp atmosphere. Stevens [7] states that over-cured rubber deteriorates faster in dry than in moist air, and under-cured rubber deteriorates faster in wet than dry. Further research on this work, however, is necessary. The deleterious action of oils is well known. Thompson [8] and others have tabulated the effects of oils and organic solvents. This list, although a large one, is gradually being added to.

Methods of Deterioration Evaluation.—In general this covers the whole subject of rubber testing, and the subject covers a large field, such as mechanical tests, strain-stress curves, tensile strength, load at fixed elongation, elongation at break or at a fixed load, permanent set, volume increase under strain, resilience energy absorption, hysteresis, hardness, abrasion resistance, and a variety of fatigue tests, etc.

Chemical Tests.—Acetone extract, changes in sulphur, changes in weight.

Special tests NOT usually made, e.g., permeability to fluids, swelling in fluids and electrical properties. Schidrowitz [9] observes that hardness, "tackiness" and perishing are bound up with ageing.

Apart from general notes, current literature contains but limited information on particular tests in relation to ageing, and the modes of using the tests in comparison of methods of deterioration.

Changes in Combined Sulphur definitely occur in all types of ageing, but more markedly at elevated temperatures and under the influence of light. Actual loss of sulphur can ensue if volatile sulphur compounds are formed. Oxygen, if combined with rubber to the extent of one per cent, will produce deterioration beyond all useful service. Marzetti [10.]

Turning to specialized tests dealing with the properties of rubber not generally examined, the most discussed problems relate to the permeability

of gases in relation to balloons, airships and protective masks (e.g., gas masks). As these deteriorate the permeability decreases, then rises as the rubber hardens to a brittle state [11].

Correlation between Ageing and Testing.—The lack of relationship between the mechanical properties and changes in combined sulphur have been studied by Van Rossem. We confirm his views [12].

Heat Tests.—The action of heat on vulcanized rubber in air, and more so in O_2, causes marked deterioration, comprising colloidal change after vulcanization, and, consequently, heat-ageing tests are incorporated in the specifications of most Governments, railway companies, etc.

In many cases, so far as the medico-pharmaceutical aspect is concerned, conditions are further complicated by the presence of cotton or other fabric as an essential part of the article. Consequently, it frequently happens that when the rubber is quite satisfactory and will withstand the moist heat of a sterilizer in such a manner as to call for no complaints, the fabric, on the other hand, is reduced to a perfectly useless condition, or the sizing used on the fabric prior to "proofing" causes the surface to become sticky or slippery. Many of the steaming tests, especially those of surgical goods, are, of course, more in the nature of performance tests rather than ageing tests. Of such tests perhaps the one known as the Geer-Evans [13] test and the so-called Admiralty Test [14] are the best known. The former test is dry heat for one hour at 132° C. and moist heat at 160° C. for three to four hours. A further test we employ, and which serves to show in some measure whether the articles are likely to be reliable is given below. *En passant* it should be noted that all these tests are not applicable to every class of rubber goods, which differ enormously in their relative uses, tensile strength and general physical condition before and after being subjected to the test we employ. This is as follows: Boiling in water for fifteen minutes; heat in an autoclave for twenty minutes at fifteen pounds pressure, then a dry heat test at 80° C. and 100° C., respectively, for several days, followed by immersion in alcohol, acetone, ether, and 5 per cent solution of carbolic acid.

Geer-Evans Test.—Samples are suspended in an oven, with ample space for good air circulation. Mechanical agitation of the air is an advantage. Air pre-heated to 70° C. is passed through the oven in sufficient volume to maintain a fresh atmosphere inside. Geer has observed differences in ageing in using three or six litres per minute are not appreciable, while only small differences were observed with air of relative humidity up to 100 per cent. Compared samples, however, must be of similar composition. This is a most useful test for high sulphur compounds. Geer and Evans point out that the test shows up "over-cure," and the test is thus of value in separating over-cured rubbers from normally or under-cured rubbers of the same stock. They further note that the sample does not harden in their test as happens in natural deterioration.

It has been observed that four months' dark storage produced a reduction

in plastometer penetration about equal to 167 hours dry test at 70° C., while four months' further storage had little effect. It must therefore be concluded that natural storage and heat ageing both produce a quick reversible stiffening, and that irreversible hardening occurs very slowly and after prolonged deterioration. Generally speaking, it may be held that the dry heat test at 70° C. is very useful as a manufacturer's test for determining on *known* rubbers the effect of cure, of deleterious impurities—such as copper, manganese and iron oxide—of various compounding ingredients. The results are less reliable in low quality rubber than in the higher qualities. As a consumer's test on unknown stocks, the results should be treated with caution. The test should always be comparative.

The Admiralty Test [14] shows a definite relationship to the keeping qualities of rubber in good storage condition (in the dark and cool). Germany, Japan, Austria and the railway companies of Great Britain and India all employ this test.

To the ordinary consumer it is frequently necessary to obtain the supply of rubber goods desired from a firm whose articles have proved, from their behaviour in general use, to have given the greatest possible satisfaction; for the difficulties in sorting the articles for contract purposes, and placing them in some relative order of merit, are great.

In some instances firms have specialized in the manufacture of a certain article or class of articles, and their products stand out as being of high standard. This may be due to the fact that the processes employed are jealously guarded secrets, and/or the workmen employed have acquired special skill.

To many it is therefore wiser policy to purchase goods from such firms, even at enhanced prices, since it is very difficult to find any series of tests which can be applied within a reasonably short time whereby the unreliable article is distinguished from the reliable. Again, the amount of any one article purchased may be such that expensive or prolonged tests would not be justified on economic grounds.

In conclusion, if this short article of ours stimulates inquiry, and possibly causes the evolution of some better means of producing and testing india-rubber articles employed in medical, surgical and pharmaceutical sciences, we feel our short contribution will not have been in vain.

Physical and Chemical Analysis of Glass and Rubber.

Conclusions.

(1) The application of the scientific knowledge of glass is gradually beginning to receive the full attention it deserves.

(2) The modern methods of heating glass furnaces have been an important factor in the development of modern glass.

(3) Tests available such as can be readily applied in the ordinary

pharmacies are necessary. The tests which are the most suitable for this purpose are the Narcotine Hydrochloride Test and Turner's Test.

(4) For optical glass the Iodeosin Test is probably the most satisfactory.

(5) An international standard brand or mark is desirable as a guarantee of the quality of glass for bottles, ampoules, etc.

(6) Such a brand or mark would distinguish glass suitable for medico-pharmaceutical work and prevent the substitution of "soft" unsatisfactory glass.

(7) Rubber is probably the most difficult of all articles used in our professions so far as satisfactory testing is concerned.

(8) Rubber, being affected by external and internal factors, must be further investigated, and simple tests are most essential.

(9) Articles made from the same formula have been found to vary enormously in tensile strength and their reaction to ageing tests.

(10) The tests described in this paper are the simplest which yield satisfactory results so far as the medical storekeeper is concerned.

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SOME RESULTS OF ORIGINAL RESEARCH INTO THE TREATMENT OF CHRONIC HÆMATURIA CAUSED BY *SCHISTOSOMA HÆMATOBIUM* (BILHARZ) AND ITS ASSOCIATED TREMATODE PARASITIC WORMS.[1]

By F. G. CAWSTON, M.D., B.Ch., M.R.C.S., L.R.C.P.

How Bilharzia Disease was Conquered in Natal.

In 1864 Dr. John Harley identified the ova of *Schistosoma hæmatobium* in the urine of some patients from Natal, thus [9] showing that the cause of the chronic hæmaturia of South Africa was identical with that which Bilharz had previously determined as the cause of endemic hæmaturia in Egypt. Following the suggestion of T. S. Cobbold in 1859 [6], the disease is generally known as bilharzia disease, in honour of the discoverer of the parasitic trematode worm which causes the symptoms.

In January, 1915 [13], Drs. R. T. Leiper and E. L. Atkinson reported the successful determination of the life-cycle of *Schistosoma japonicum* by some Japanese workers whose conclusions they had confirmed. This resulted in some investigations being made at Pietermaritzburg, Natal, when [4*a*] it was claimed that *Physopsis africana* Krauss served as the carrier of the disease in Natal. The late Dr. R. P. Cockin considered the report likely to prove correct; but he emphasized the importance of experimental proof. This was obtained the following year, when Dr. J. C. Becker reared adult schistosomes from cercariæ obtained from *Physopsis africana* in the Transvaal [1*a* and 1*b*].

The presence in various parts of South Africa of fresh-water snails which might serve as carriers of *Schistosoma mansoni*, should this common Egyptian parasite be introduced into the Union by troops returning from service overseas, emphasized the importance of curing all carriers before allowing them home on leave. However, by 1921, the parasite was discovered in persons who had never left South Africa and was identified in examples of *Physopsis africana* Krauss and *Planorbis pfeifferi* Krauss [4*e*].

Since that time the infection has become gradually more common. It is possible that the parasite has existed in South Africa for many years, and that the impetus to the study of bilharzia disease which resulted from the work of the Bilharzia Mission to Egypt in 1915 [12*a*] and the reported success of the antimony treatment by Dr. J. B. Christopherson in 1917 [5], was responsible for the discovery of *Schistosoma mansoni* so far south.

In 1919 adult examples of *Schistosoma bovis* were reared at Durban from cercariæ occurring in *Physopsis africana* Krauss [4*h*], and ova similar

[1] Read *in absentia* at International Congress of Tropical Diseases, Cairo, December, 1928.

to those of this rare schistosome are occasionally found in the human urine along with those of the commoner human schistosomes.

With due consideration of the fact that schistosomes have a tendency to die out of themselves without treatment of any kind, little reliance can be placed on the older methods of treatment used in Natal over prolonged periods. It was not until 1919 that the use of intravenous tartar emetic in the treatment of bilharzia disease became known, and the results I obtained at Durban justified the claims that were made as to its value in Egypt.

Intramuscular injections of colloidal antimony also proved of service in the treatment of some frail children, until their general health had improved and a course of intravenous antimony could be arranged [4*d*]. Without hesitation one may say that the introduction of antimony therapy in the treatment of bilharzia disease [5] has made curable an intractable condition which was previously incurable by medical means, and that we have yet to discover a more reliable method of treating the disease. I am in entire agreement with the conclusions reached by some Egyptian practitioners [11*a*] that the important point to bear in mind when treating this condition is that the patient must be kept under the continual influence of the drug for a period of one month, and that the regularity of the doses employed, which should be as great as a patient can tolerate without toxic effects, is of far greater importance than the amount of drug administered in the course.

Although in the vast majority of untreated cases of bilharzia infection occurring in South Africa the hæmaturia is fairly constant and very persistent, in others no obvious signs of infection are observed until the removal of an appendix reveals the presence of the ova of *Schistosoma hæmatobium.*

Incidence of the Disease.

In the Transvaal bilharzia disease exists amongst the Dutch children and the natives in certain well-defined areas. Adult schistosomes are also occasionally found post-mortem in natives who have been imported to work on the gold mines. Every credit is due to some voluntary workers who have attempted to eradicate the disease from badly-affected centres such as Rustenburg.

In Natal, bilharzia disease is contracted and spread largely by the Indian population. These persons are not subjected to such diseases in Madras from which Presidency most of their parents came, and therefore they do not sufficiently recognize the dangers to which they and their children are constantly exposed when standing in semi-stagnant pools fishing, or when crossing the slow-running rivers of Natal. Pools at brick-fields are also favourite bathing places for Indian children, for natives and for indigent European children ; and, at the Natal coast, these are heavily infested with the bilharzia parasite.

Sources of Infection.

Although most easily found amongst the blue-lotus plants or broad reeds at low altitudes, *Physopsis* occurs at several places over 4,000 feet above sea-level, and I have collected infested examples in the Transvaal at an altitude of 5,000 feet [4*b*] and at Rustenburg, a heavily infested locality on a tributary of the Crocodile river where *Planorbis pfeifferi* also abounds over 4,000 feet above sea-level.

The symptoms caused by the escape of the ova of *Schistosoma mansoni* are largely confined to the bowel, and the completion of the life-cycle is closely associated with the habit of defæcating in shallow pools or marshy lands which contain much close vegetation, such as water-cress and the water-hyacinth, *Eichhornia crassipes* (Ponteder) and thus favour the development of *Planorbis*. The ova of *Schistosoma hæmatobium* escape mostly in the urine, and the completion of the life-cyle of this parasite is facilitated by the fact that *Physopsis* and *Bullinus* grow most plentifully in collections of less stagnant water where human beings bathe. The cases of bilharzia disease that have been reported from Portugal [2] are too few for any conclusions to be drawn from the fact that *Schistosoma hæmatobium* has been reported only from species of *Planorbis* in that country. An investigation into the source of infection of troops stationed in the south of France during the recent war would be of great interest in this connexion.

Principles of Treatment.

I do not know of any conclusive evidence proving that the adult *Schistosoma mansoni* favours the mesenteric vessels surrounding the intestines more than the adult *Schistosoma hæmatobium*. In South Africa adult examples of the latter worm have been obtained post mortem from the portal vein, and those which I reared in guinea-pigs and rats were found either in the liver substance or in the mesenteric veins; I have never heard of any being found in the vesical vessels. I believe we may take it for granted that all bilharzia patients are suffering from a certain degree of hepatitis, due to the development of the parasites in the liver. The hepatic changes which have been recorded in cattle which have died towards the end of a course of treatment with massive doses of tartar emetic for Nagana [19], show that large quantities of distilled water, or unnecessarily large doses of tartar emetic should be carefully excluded from the treatment of a disease which is always associated with a certain degree of hepatitis [4*c*].

Methods of Treatment.

Under a grant from the British Medical Association in 1920, I attempted to show how bilharzia disease might be permanently cured with the least possible risk to the patient [4*f*]. Recognizing that a distinct advantage is sometimes gained by combining various drugs which are calculated to attack the parasites from different directions at the same time, I tested the value of treating cases with both antimony and arsenic, or antimony and

emetine, giving the injections alternately; but no improvement was shown over the use of freshly dissolved antimonium potassium tartrate given in small doses of saline intravenously over a period of a complete month, nor could the period of treatment be shortened by giving doses large enough to cause toxic effects to the patient. A dental needle, twenty millimetres in length, fitted to a three-cubic-centimetre all-glass two-piece syringe was found most serviceable in all cases; whilst the use of combined tablets, containing four grains of the pure drug and two grains of sodium chloride, enables practitioners to prepare a solution sufficient for a number of patients, by dissolving the tablet in boiling water immediately before use.

The doses employed were necessarily smaller than those that are required when the sodium salt is used; but a careful record of the urine of these patients for several months later proved the advantage of a line of treatment which was free from risk to the patient and enabled him to continue his usual employment throughout the course of injections. It was found to be essential for the patient to attend regularly for his injections. I find it best and most convenient to give five injections the first week, four during the second and third week, and three or four during the last eight days. Commencing with ½ grain, i.e., 0·032 gramme for an adult and working up to 1¾ grains, i.e., 0·112 gramme, climbing down to 1½ grains, i.e., 0·096 gramme, if there is any tendency to catarrhal symptoms or distressing cough, most patients receive a total of under twenty grains which has proved sufficient for all adults that have come under my care [4*m*].

Estimation of Cure.

The urine was usually examined from three to twelve months after treatment had been discontinued. It was passed in my presence, the last portion being passed into a wide test-tube, centrifugalized and examined microscopically by myself. An incomplete course of injections resulted in the presence of leucocytes and epithelial cells in the urine by the end of the second month, by which time living ova began to reappear. In one case where hæmaturia persisted in spite of thorough treatment, the patient was suffering from a papillomatous condition of the bladder from which he subsequently died.

The following failures in 1919 are considered to be due to the use of too small total doses and irregular attendance of the patients. In each case the disease subsequently died out of itself, or the patient received a further course of injections which produced a permanent cure. I have never come across a case of idiosyncrasy, so that the patient could not tolerate the required doses of the potassium salt; though, in some cases there has been a tendency to vomit during the last few injections which I attribute to an accumulative action of antimony. In the earlier days of the antimony treatment, before I could obtain the purified potassium salt, the patients sometimes experienced severe toxic effects and the course of injections had to be stopped for a few days at a time.

Age	Duration of disease	Dose of tartar emetic	Result
16	5½ years	13½ gr. in 25 days	Ova 108 days later
16	4 ,,	11 ,, ,, 38 ,,	,, 75 ,,
16	1 ,,	7¾ ,, ,, 21 ,,	,, 180 ,,
17	4 ,,	15½ ,, ,, 22 ,,	,, 52 ,,
17	7½ ,,	10 ,, ,, 27 ,,	,, 99 ,,
17	7 ,,	12½ ,, ,, 25 ,,	,, 62 ,,
15	4 ,,	12¼ ,, ,, 32 ,,	,, 73 ,,
15	5 ,,	12 ,, ,, 31 ,,	,, 86 ,,
22	10 ,,	8⅞ ,, ,, 14 ,,	,, 108 ,,
24	5½ ,,	12½ ,, ,, 24 ,,	,, 92 ,,
25	18 ,,	12¾ ,, ,, 40 ,,	,, 277 ,,

It will be noted that only one of these patients received more than fifteen grains or 0·96 gramme as a total dose. Further experience also showed that it was better to give the required total dose over a period of not more than one month. Bi-weekly injections are unreliable in their effect and daily injections do not shorten the course of treatment essential to produce a permanent cure. An occasional attack of renal colic taking place even during the injections is no indication for discontinuing the injections ; only occasionally is a renal calculus revealed by X-ray examination, though the symptoms may point very strongly to its presence. It should be expected in all cases where colic occurs after frequent examinations of the centrifugalized urine fail to reveal the presence of living ova. The attacks are often associated with the escape of dead ova in the urine. I consider that the escape of even dead ova is very suggestive of the presence of schistosomes which have escaped destruction during the course of treatment.

Typically Successful Treatment of Cases.

Age:	31	27	25	21	20	19	17	15	13	13	12	12	
1st day	½	½	½	½	½	½	½	¼	¼	¼	⅜	⅓	grain
2nd ,,	¾	⅞	1	1	¾	—	¾	½	⅜	½	½	⅜	,,
3rd ,,	1	1⅛	1¼	1¼	1	¾	1	¾	—	¾	—	⅜	,,
4th ,,	1⅕	—	—	1¼	1¼	1	—	—	½	—	¾	⅞	,,
5th ,,	1⅖	1¼	1½	—	1½	1⅜	1	1	—	1	1	—	,,
6th ,,	1½	—	1½	1½	1½	1½	—	—	¾	—	1¼	1	,,
7th ,,	—	1⅜	—	—	—	1½	1¼	¾	⅞	1¼	1	—	,,
8th ,,	1½	—	—	1½	1½	1⅝	—	—	1	—	1¼	1	,,
9th ,,	—	1½	1¾	—	1¾	—	1¼	—	1	1¼	—	1	,,
10th ,,	1½	—	1¾	1¼	1¾	1¾	—	1¼	—	—	—	—	,,
11th ,,	—	—	—	—	1¾	2	1¼	—	1⅜	1¼	—	1¼	,,
12th ,,	1½	1½	1¾	1¼	—	1⅓	—	1½	—	1¼	1¼	1½	,,
13th ,,	—	1½	1¾	—	1¾	2	1½	—	—	—	1¼	—	,,
14th ,,	—	—	—	1¼	—	—	—	1⅔	1	1¼	1⅝	1	,,
15th ,,	1⅛	—	1¾	—	1½	2⅓	1¼	—	—	—	1⅜	—	,,
16th ,,	—	1½	—	1¼	—	—	—	1⅓	1¼	1¼	1½	1¼	,
17th ,,	1	1½	1¾	—	1½	2⅓	1¼	-	—	—	—	1½	,
18th ,,	—	—	—	—	—	—	—	1⅓	1	1¼	1½	1¼	,,
19th ,,	1¼	—	1¾	1¼	1½	2	—	1⅓	1	—	1½	—	,,
20th ,,	—	1½	2	—	—	—	1⅛	—	—	—	1¼	1¼	,,
21st ,,	1⅛	—	—	1¼	—	2	—	1⅓	1⅛	1¼	—	—	,,
22nd ,,	—	1½	2	—	1½	2⅛	1¼	—		—	—	1¼	,,
23rd ,,	—	—	—	1¾	—	—	—	1⅓	1⅛	1	—	—	,,
24th ,,	1⅛	—	—	—	1¾	—	—	—	—	—	—	1⅜	,,
25th ,,	—	—	—	—	—	—	—	—	—	1	—	—	,,
26th ,,	1⅛	—	—	1¼	1¾	—	—	—	—	—	—	1⅜	,,
27th ,,	—	—	—	—	—	—	1¼	—	—	—	—	—	,,
28th ,,	1¼	—	—	—	1¾	—	—	—	—	—	—	—	,,
Totals	19	15½	22	17	26	25	14	14¼	12	14½	17	15	,,

All under 1 gramme as a total dose.

The preceding is a series of twelve typical cases of bilharzia infection who were treated with the potassium salt of antimony. The ova became gradually more degenerate until they disappeared completely from the urine and did not recur. In each case the dose was regulated so that the largest quantity of the fresh solution was given without causing more than a slight cough.

The Limited Value of Emetine Therapy.

Various attempts have been made in Natal to effect a cure of bilharzia disease by the use of emetine. Some preparations are less toxic than others and emetine periodide may be given by the mouth with decided effect on the hæmaturia and a corresponding destruction of the adult parasitic worms. Unfortunately no record is at present forthcoming as to any undoubted permanent cures that have been obtained by the oral administration of this preparation, and intramuscular or intravenous injections of a more reliable remedy are to be preferred.

At one time a number of cases were treated by subcutaneous injections of one-third or half grain of emetine given twice daily for three weeks. This resulted in an apparent improvement of the symptoms; but failed to produce a permanent cure. The daily injection of one grain for ten days has also been claimed as sufficient to cure a number of cases; but it would appear that the injections must be given regularly over a period of one month in the same doses as are used with the potassium salt of antimony and with the same regularity, if a permanent cure is to be obtained in every case [4*p*]. Unfortunately, many patients are unable to tolerate the accumulative effects of the drug and, as the early signs of cardiac failure during the last part of the month are a little difficult to determine in time, fatal results have been experienced quite unexpectedly in young persons. A good deal of local reaction may be avoided by giving the emetine intramuscularly in a solution of 1 per cent carbolic lotion. As with antimony therapy, the death of the parasites is a very gradual process and no advantage can be obtained by giving the drug intravenously, unless it be to avoid local discomfort.

The Problem of Cure in the Case of the Young.

Mass treatment of bilharzia disease will not become very popular until it has been discovered how to cure the disease by oral administration of some drug. In August, 1927, I administered 8½ grains of tartar emetic to a little boy of 9. He was unable to tolerate more than ¾ grains at a time because of his tendency to cough, which was associated with an enlarged tonsil and the remains of an attack of whooping-cough. Hæmaturia returned a few weeks later, but he was not inclined to submit to more injections of which he had had thirteen. In view of the proved efficacy of carbon tetrachloride in the treatment of fasciola infestation of cattle and

sheep, it was decided to test its effect in this case. Eleven cubic centimetres were given in fifteen days, ¾ cubic centimetre being taken on rising and followed in about an hour by a dose of magnesium sulphate. No toxic effects occurred; the hæmaturia definitely lessened and some of the ova degenerated, but the improved condition was only temporary. No improvement was detected by the use of benzol, so one was forced to repeat the course of intravenous injections six months after the first course. With the assistance of small doses of codeine taken half an hour before the injections, 14½ grains of the potassium salt were given in twenty-six days, thus curing the complaint.

Although colloidal antimony is effective in treating some cases of bilharzia disease, where intravenous injections are impossible on account of the smallness of the veins, I prefer to use intramuscular emetine. It is important for the patient to whom an intravenous injection is given to clench his fist whilst the solution is being injected, but the improvised tourniquet must be loosened as soon as blood is seen to run freely into the syringe, showing that the point of the needle is lying free within the lumen of the vein. The very rapid degeneration of the ova that is observed where carbon tetrachloride is given daily for three or four days, followed by magnesium sulphate only where there is a tendency to vomit, indicates a very useful means of dealing with certain cases of bilharzia infection, provided a purified preparation is employed.

Other Conditions improved by Antimony Therapy.

In Natal, bilharzia disease is not usually complicated by infection with other parasites, though more than one species of schistosome may occur in the same patient. A strong eosinophilia is sometimes a valuable indication of bilharzia infection, and the blood-test may serve as a useful means of deciding whether treatment has been successful in removing the parasites from the system. However, patients have sometimes reported the passage of intestinal worms during a course of treatment for bilharzia disease and have noted improvement in chronic skin conditions. Creeping eruption is common at the Natal coast, more especially amongst children who are allowed to sit on the moist soil of gardens frequented by domestic pets. A portion of skin removed by me from a case of this creeping eruption, contracted by an adult whilst gardening at Durban, shows a long and narrow larva coiled up in the burrow through the epidermis. Though sometimes responding to treatment by freezing or pricking with a hot needle, cases have shown rapid improvement by the use of one or more intramuscular injections of colloidal antimony or an intravenous injection of tartar emetic. One case of hydatid disease was given a course of intramuscular injections of colloidal antimony and emetine [4*j*]; this resulted in a shrivelling of the cyst and a dropping of the eosinophilia from 16 to 8 per cent within a month. It would appear that it was the emetine, of which

she received $6\frac{1}{3}$ grains, rather than the antimony which caused the improvement in this case, though the combination might well be tested on a larger scale in cases of hydatid disease. I am not aware of any more efficient remedy for cases of ulcus molle than one or two intravenous injections of tartar emetic, but I can understand how those who have not had much experience of antimony therapy may hesitate to make use of this tried remedy in place of other methods. Intravenous antimony assists in cleaning up cases of chronic cystitis and is of undoubted service in syphilis where there are pronounced skin conditions or intractable keratitis [4*i*]. Similar success is promised in tubercular cases with "dirty sputum," skin and eye-complaints [4*a*] as it has been obtained in these conditions when caused by leprosy [4*g*]. In Central Africa, where leprosy, syphilis and yaws are common and they are likely to be mistaken for one another or even occur in the same patient, colloidal antimony has produced some very encouraging results. As these lepers are also very prone to be attacked by scabies, a colloidal preparation containing both antimony and sulphur has much to recommend it, where intravenous injections of the cheaper salt are impossible to arrange.

The Need for Scientific Study in Preventing Bilharzia Disease.

The investigations which were made by the Bilharzia Mission to Egypt in 1915 [11*a*] demonstrated how needful it was for the Government to employ competent zoologists to advise in measures undertaken to prevent the spread of water-borne diseases. The value of the natural science tripos at Cambridge has long been recognized for students preparing for a medical degree, and other universities have somewhat similar advantages. A due consideration of the life-history of the bilharzia parasites is essential to public health workers in Africa, as well as a careful recognition of the intermediate hosts in the various countries where preventive measures are under consideration.

Under the Streatfeild Research Scholarship of the Royal Colleges I undertook a survey of those fresh-water snails in South Africa which might serve as carriers of trematode parasitic worms [4*l*]. The survey was assisted by a small grant from the Royal Society, and Dr. E. C. Faust has published an illustrated description of all the larval parasites which were thus obtained [8*a* and 8*b*]. From the experience I thus gained I am convinced that *Physopsis africana* Krauss is the fresh-water snail that should certainly be eradicated as far as possible from all South African bilharzia districts; though the infection has occasionally been found in closely-allied species. *Planorbis pfeifferi* should also be prevented from breeding in pools where human beings bathe and, where fluke disease of cattle occurs, every endeavour should be made to avoid the breeding of both *Limnæa truncatula* Müller and *Limnæa natalensis* Krauss. The wholesale destruction of fresh-water snails in any district should never

be attempted. I have found both *Physopsis globosa* (Morelet) [4*k*] and and *Planorbis pfeifferi* Krauss [7] infested with schistosomes at Lourenco Marques. *Physopsis globosa* (Morelet) occurs occasionally in Natal.

The Problem of Identifying the Molluscan Hosts.

Doctor J. F. Corson tells me that cercariæ apparently identical with those of *Schistosoma hæmatobium* occur in *Physopsis nasuta* E. var. Martens at Dar Es Salaam, and *Physopsis ovoidea* Bourguignat is believed to be the carrier at Zanzibar. Though the columella of the shell of *P. globosa* Morelet, which would appear to serve as the carrier for bilharzia infection across Central Africa, and that of closely allied *Physopses*, is often so ill-defined that some of these shells have been described as belonging to *Bullinus*, the oblique columella of *Physopsis africana* Krauss is so constantly present, and so well-defined in the vast majority of examples, that it may readily be differentiated from one of the *Bullinus* subgenus [14]. The shell of *Bullinus tropica* (Krauss), under which species the majority of similar South African shells may very well be classed, is only rarely infested with schistosomes; though in Northern Africa *Schistosoma hæmatobium* would seem to be almost confined to such species of *Bullinus*. The presence of schistosome infestation in what was described as a hybrid obtained from the breeding of various species of *Isidora* confirms the opinion as to the identity of various so-called "species" of *Bullinus* amongst South African shells.

A more careful study of the teeth and soft parts of *Bullinus* and *Physopsis* would probably result in a simplification of the nomenclature[4*o*]; for many of the names now in use might well be dropped, and the study would possibly reveal more Egyptian species identical with those found in other parts of the Continent, now known under other names.

The Problem of the Rare or Accidental Host.

The occurrence of cercariæ morphologically identical with those of *Schistosoma hæmatobium* in examples of *Bullinus forskalii* (Kraus s), both in Egypt and in Natal, illustrates how the parasite may occasionally occur in hosts other than those in which it is usually found. The discovery of the same styletted cercaria in both *Limnæa natalensis* (Krauss) and *Melanoides tuberculatus* (Müller) prompted the suggestion that a parasite which usually chooses a non-operculated species as its intermediate host might, under conditions which would cause the death of such a host, prolong its existence by infesting such a species as *Melanoides*. *Melanoides tuberculatus* (Müller) is an occasional carrier of *Schistosoma japonicum*, and Professor R. T. Leiper has recorded [12*b*] an eye-spotted bilharzid cercaria in both *Planorbis* and *Melanoides tuberculatus* in Egypt. I have collected examples of this operculated shell at Zanzibar and Dar Es Salaam, and the species is very plentiful in parts of Natal.

The Problem of the Destruction of Infested Molluscs.

Stranded examples of the non-operculated species of *Limnæidæ*, when exposed to the sun's rays and the dry winds, rapidly succumb (3). Nevertheless, *Physopsis africana* (Krauss) has survived twelve days' burial in garden soil at a depth of two inches from the surface, and both *Bullinus tropica* (Krauss), and *Planorbis pfeifferi* (Krauss) have lived after being buried for twelve days at a depth of ten inches, placed in a basin of water for six hours and then buried for a further period of twenty-five days at the same depth of soil. Both *Limnæa natalensis* and *Physopsis africana* would appear to be far less resistant to periods of desiccation than *Bullinus tropica* (Krauss), whose perforate shell is common in all South African vleis which are likely to dry up during the winter months.

The resistance of *Planorbis* to uncongenial surroundings would seem to be greater than that of either *Physopsis* or *Bullinus*; for the animal is well able to draw itself into the small aperture of its shell and protect itself by the secretion of a membranous epiphragm. *Planorbis spirorbis* has thus resisted four months' desiccation, whilst *Ancylus* has survived a whole winter without water. *Limnæa* is also better able to resist the effect of poisonous fluids, because of its habit of climbing out of the water, a habit which is less obvious with species possessing the stouter shells of *Bullinus* and *Physopsis*. For this reason, copper sulphate solution (11*b*), or better still, the crushed root of *Tephrosia*, a common wild plant of some bilharzia districts in Africa, is particularly destructive to the common intermediate host. The variety of this plant which occurs in Natal, known by the natives as "Ilozana," is *Tephrosia macropoda*. It is found in Zululand and a few coastal places in South Africa. *Tephrosia vogelii* occurs in the Nile Land, in Upper and Lower Guinea and in the Mozambique district; so that it might be employed to control bilharzia infection in Egyptian wadys.

Co-operation with the Administration.

Wherever possible, the attention of the Public Health Authorities has been drawn to conditions favourable to the growth of *Physopsis* in infected districts. As a result of this, the Provincial Administration of Natal erected warning notices at one pool where young persons were continually becoming infected. The superintendent of Education for Natal gave permission for lectures on bilharzia prevention to be given at Durban, and expressed his thanks for the visits that were made to most of the schools. Where pools were known to be harbouring infection on private property, the owners were approached and, in some cases, this resulted in the introduction of domesticated duck which proved useful in preventing much of the infection. The need for *training* small tributaries and clearing away the rushes from the banks of rivers has been repeatedly emphasized. In response to a request for an authoritative statement on the local conditions favourable to the spread of bilharzia disease, I have forwarded a full

report to the Health Authorities at Klerksdorp and Pretoria, Transvaal, to Newcastle and Durban in Natal, and to Umhlali in Rhodesia. At the request of the Public Health Department, I visited the site of the Defence Forces' camp at Ammersdale in Natal, recovered an infested example of *Physopsis* from the river there and advised as to the safeguarding of the water-supply of the camp. I reported the discovery of the local intermediate hosts for the bilharzia parasites at Lourenco Marques to the Medical Officer of Health at that Portuguese port, and have reported in the medical and scientific journals the probable carriers which I have collected at Beira and at Zanzibar; these experiences are recorded to indicate along what lines the private practitioner may assist the local health authorities in the possible control of bilharzia infection throughout the African continent.

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RING UP THE CURTAIN !

By U.P.A.

(*Continued from p.* 350.)

II.

Dresden was our next stopping place.

Our hotel was in the new market square, and faced the Frauenkirche. The latter, externally, is an imposing well-proportioned building, with a fine dome. Internally, however, it is more like Hengler's Circus than a church.

The hotel was only a place of residence: we had to go out for meals and, in consequence, we had quite an amusing and variegated time.

In your normal rôle of officer and gentleman you may go to the Hotel Weber, near the Opera House. Not far away is the Hotel Bellevue, which has a frontage on the Elbe, adjoining Frederick the Great's "balcony of Europe." Go there once or twice in your moments of excessive financial optimism. You will get something which almost compensates the shock of the resultant bill.

However, after the opera we often felt tired or lazy, and drifted into the nearest restaurant. This was a little place which provided excellent drinks and good food at minimum prices. The service was sketchy and the appointments part worn: there was a deficiency of aprons, white, waiters, for the use of, and the floor was better acquainted with sawdust than with soap. Still, these minor shortcomings did not affect the quality of the ham and eggs, or cheese and pumpernickel. The world, like the Pilsener, is golden when viewed through the bottom of a tall glass. Neither Georgina nor I aroused any curiosity in the place, for its habitués seemed to come from all classes, except the very rich: a lover and his lass; a policeman just off point duty; a Harley Street consultant having a night out; a costumier with his leading mannequin; a bank clerk, a typist and half a dozen nondescripts—all hungry, thirsty and very much at ease. A small orchestra was grouped round a big anthracite stove. The leader was a short, very fat man. He had not been brought up in the Tennessee school, thank goodness: he chose Suppé and Johann Strauss. He played a violin, and played it with such energy and abandon that, with the aid of the stove, he was in a perpetual Turkish bath condition. But for this, his equatorial measurement would have reached an incredible figure. He displayed the characteristic mentality of his type: always merry and bright.

Given the proper time and place, the spirit of vagabondage will awake in most of us, even in Georgina.

Dresden, the Elbe and the immediate surroundings are full of interest and beauty. A fine city in a fine setting. There you have a varied and manifold choice of the riches of Nature and of the best works of man.

The view from the heights of Weisser Hirsch down the river, over the city and away to the ring of hills beyond—the whole prospect covered with snow—was wonderful.

The Zwinger Picture Gallery contains Raphael's Sistine Madonna: a marvellous creation. The Green Vault is a unique and fascinating collection of *objets d'art*, many of them priceless. And in the Castle there is a splendid collection of china of all kinds with, of course, a good selection of Meissner.

When we inspected this collection it was, as usual, bitterly cold outside and piping hot inside. Soon, Georgina was carrying her fur coat over her arm. A solemn curator, *tête carrée*, approached and said, "It is forbidden a coat to carry." His manner was far from polite, like Serjeant-Major Bangs to Private Small, "Git y'r 'air cut."

Georgina at once assumed the initiative. She ignored the china, and concentrated all her available forces on the unfortunate *tête carrée*. Calm and collected, she smiled on the doomed curator with the smile peculiar to the inscrutable Sphinx. If the *tête carrée* had transferred his attentions from her coat to her eyes, he would have avoided an unpleasant half hour.

"Why?" Georgina inquired, as if inspired by nothing more than childish curiosity.

"Because you might conceal something under it."

An awkward pause ensued.

Georgina pretended that she did not understand.

I took refuge behind a large porcelain group, and decided to act as *rapporteur*, but Georgina had me out.

"What did the gentleman say?" she asked me, in English. I told her.

"Pooh! I knew that." She turned slowly towards the poor *tête carrée* and surveyed him leisurely, witheringly, from his thick, heavy soles to his bald, shiny pate. Every inch of him was subjected to a minute inspection. The wretch diminished in size before my horrified eyes. He squirmed, and a big brass collar stud disengaged itself, with a jerk, from beneath his tie. Georgina fixed her penetrating gaze on the stud. The stud suddenly retracted, and pressed sharply on its owner's cricoid. The *tête carrée's* respirations became quickened and laboured.

After an interminable time, Georgina relieved the agony by asking, "Did you say that *I* might conceal something under my coat?"

If the *tête carrée* had answered "Yes," there is no doubt that Georgina and I would now be inmates of a nice new building which we had already seen from the outside—Dresden Prison. Thank heaven his moral failed him: he made no answer at all: he slunk away.

Georgina, the embodiment of innocence and virtue, returned to the china.

Eventually the coat was deposited at a counter. But Georgina was not content with this. She overhauled it at frequent intervals, turned it upside down and inside out, banged the pockets, and assured the smiling old lady in charge that there were no teapots in the lining. Meanwhile the

tête carrée pretended that he was not looking; but he was; he became white-crimson-white in turn.

On leaving, I expostulated. "Georgina—unfair. The unfortunate man was only carrying out orders."

"Well, next time, he will carry them out more politely; and anyhow, now he knows that *he was not dealing with one of his own women*, poor dears."

Georgina does not often behave like that. When she does, she usually puts forward some unanswerable reason. F.S.R., I. 1 (1) says: "War can be brought to a successful conclusion only by the defeat of the enemy's armed forces and the destruction of his powers of resistance."

Talking of F.S.R.—it is but fair to Fritz to admit now that, on one occasion, we were defeated by a superior tactician who employed the element of surprise, "the most effective and powerful weapon in war."

The Fritz in question was a uniformed attendant at the Dresden Opera House.

One evening we were delayed in leaving the place and, as we emerged under the archway, we saw that the attendant was about to close the gates.

We made a dash for it.

Fritz waited for us, and then deliberately slammed, bolted and barred the gates in our faces, and told us to go to the devil.

This was such unprecedented behaviour—so entirely unlike anything we had ever encountered before (or, I am glad to say, since)—that, for the moment, we were dumbfounded.

It is impossible to traverse a stout iron grille, but it is possible to speak through the interstices. On recovering our presence of mind, we fired at the clever individual on the other side of the grille an epithet which was popular when—well—when I was at The War.[1]

It was Fritz's turn to be astonished. In the lamplight we could see surprise and rage registered on his unpleasant features.

After a moment's indecision he turned away, muttering, and strode across the empty square.

By the time we had made a detour of fifty yards through the deep snow, he had disappeared.

It is interesting to observe how different nationalities will behave under similar circumstances.

If you tackle an Englishman who is in the wrong, he will apologize, or call the police, or smite you heavily on the nose. In fact, you cannot guess beforehand what line of action he may take.

A Frenchman so placed always becomes noisily voluble. The more he is in the wrong, the more effectively will he talk you down. His tongue has solved the problem of perpetual motion, and your only remedy is to go away.

Or an Italian—ah! At Naples I once saw a careless, good-for-nothing

[1] *The author apologizes for dating the epithet in this archaic manner.*

quay loafer drop a passenger's baggage into the middle of the harbour. After that it was difficult to determine whether the passenger was a criminal, a lunatic, or merely an arrant ass. There was, however, no doubt that the loafer was a hero and a saint, despite his foul tongue, ugly temper and villainous face.

But tackle a German who is in the wrong, and straightway he collapses. Fritz has no moral in evil-doing, once you have found him out.

Nowadays, Berlin leads the world of Teutonic opera, with Dresden and Vienna fighting for second place.

On the evening of our arrival in Dresden we changed hurriedly, doubled across the great square—it was heavy going on account of the deep snow—and secured a box in the second row.

The piece was Massenet's *Manon l'Escaut*, timed to begin at 7.30 p.m.

We fetched up at 7.31 p.m., and were, of course, refused admission to the box. Throughout the first act we had to stand in the remotest and loftiest corner of the gallery.

The vast theatre was darkened and hushed. The crowded audience was sensed rather than seen. We looked down on the heads of the pygmies who occupied the immense, brilliantly lighted stage. In front of, and below, the stage, an orchestra of more than ninety musicians was spread over an area which gave ample freedom of movement for each member. Despite our apparently hopeless position, and the fact that the house was full, we could hear clearly the softest and lowest notes.

Manon l'Escaut was well produced, even to a real stage-coach and horses; but everything at the Dresden Opera House is well done. However, this piece is essentially French, and you cannot help feeling that the chubby little tenor, the Chevalier de Grieux, wishes he were out of his finery and into his cassock again: wishes he were done with Paris, and back in Thuringen. He has become so used to playing the high-minded ascetic—so used to putting his best into sackcloth and ashes—that the part of the young French blood comes amiss.

So it is with the rest of the cast: Gallic gaiety, freedom, esprit, are lacking: Fritz is not very *spirituel*.

Naturally, operas such as *Manon*, *Werther* and *Lakhmé* are best seen on their native soil. The fact that the uniforms and equipment, drill, and general bearing of the British officers and men who appear in *Lakhmé* would send a hardened music-hall audience into gleeful hysterics, does not invalidate the argument: these are the creations of a French impresario: just what you would expect him to turn out, and quite in keeping with the spirit of this delightful opera.

If the Paris press can picture H.R.H. The Prince of Wales in the uniform of the Guards Gold Stream, surely we may expect the British Army in Burma to be uncommonly picturesque.

Tannhäuser was our next opera.

At present this opera seems to be in a rather fluid state; something like the Church of England services, 1929. Thus, in one theatre the shepherd and his pipe may receive little attention, whereas, in another, they may dominate the action in a pretty and very artistic manner. In Dresden, Venus is a comparatively sober-minded, colourless nonentity: in Wiesbaden she is a personage of importance, with a kiss as long as an old campaigner's stories. "O! Star of Eve" may be heard incidentally—or may be a marked feature of the scene.

These differences arise from certain stormy passages in the composer's early manhood, whereby the youthful Tannhäuser was, at first, compelled to lead a somewhat chequered life.

The opera was written between 1843 and 1845. In 1848 Wagner, who was then aged 35, and conductor at the Dresden Opera House, took an active part in the revolution. He was a close friend of Georg Herwegh, "the iron lark, the song-bird of war." Another of his "comrades" was the Russian Michael Bakunin. In his autobiography Wagner thus describes the start of the street-fighting in Dresden, which cost the rebels one hundred and ninety lives. The tocsin of revolt was suddenly sounded by the bell of St. Ann's :—

> The clang of this bell, so close at hand, made a profound impression upon me also. It was a very sunny afternoon, and I at once noticed the same phenomenon which Goethe describes in his attempt to depict his own sensations during the bombardment of Valmy. The whole square looked as though it were illuminated by a dark yellow, almost brown, light, such as I had once before seen in Magdeburg during an eclipse of the sun. My most pronounced sensation beyond this was one of great, almost extravagant, satisfaction. I felt a sudden strange longing to play with something hitherto regarded as dangerous and important. . . .

In this there is more of the melody maker than of the murderer; but unless Wagner's revolutionary sympathies and actions are borne in mind, the true significance of his libretti and scores is missed.

The revolution in Saxony was speedily and ruthlessly suppressed, whereupon Wagner found that, for the sake of his health, it would be better to live elsewhere. He wandered about Switzerland and France, and visited England. Those were lean years. *Tannhäuser* was not quite to the liking of Parisian audiences, so Wagner infused into it a certain amount of Gallic spirit until, in 1861, Venus became a most attractive young person attended by a brilliant ballet.

Eventually, the composer was received back in the Fatherland, and placed in an honourable and powerful position; and *Tannhäuser*—the authorized edition this time—was again produced at Dresden in 1890.

Wagner's first opera was *Rienzi*: the libretto from Bulwer Lytton's novel. Although this opera is somewhat conventional (in his latter years Wagner criticized it harshly), still, in the orchestration, and particularly in the use of the brasses, there is a forecast of what is to come.

The Flying Dutchman followed. It was written in Paris, when Wagner and his young wife were enduring a hand-to-mouth existence. Is it not marvellous that he who creates a thing of lasting beauty is, as often as not, in the grip of cold, hunger and even disease? Truly, the real artist is born, not made.

In its final shape, *Tannhäuser* marks the beginning of Richard Wagner's greatness. In this work the composer—now his own librettist—realizes his ambition, the production of a purposeful, balanced ensemble. There must be a story worth the telling, i.e., a good piece of socialistic propaganda. It must be driven home by efficient vocalists and the biggest and best orchestra procurable. Scenery, costumes and effects must be appropriate and above reproach.

But over all—*the orchestra.*

Tannhäuser and his orchestra astounded, dismayed, and even enraged the critics of the day. In England, particularly, the connoisseurs violently assailed Wagner with every opprobrious noun and scathing adjective in the dictionary. To-day their remarks make quite amusing reading.

But Wagner was nothing if not a fighter, so, backed by a considerable number of influential adherents and patrons, he went further; and the further he went the more did he demand of his orchestra. Indeed, in his later operas, the usual rôles are reversed: the voices become an accompaniment for the orchestra: a remarkable and original idea.

Perhaps, some day, Germany will show a good example by forbidding the playing of Wagner by orchestras numbering less than fifty musicians.

This superiority of instruments over voices has inevitably produced effects which are more or less acquiesced in by German audiences, but which are not approved of by English listeners. In Wagnerian opera a German audience is content with vocal efficiency only: quality is a secondary consideration. In England and other countries—notably in Italy—vocal quality is everything. We do not appreciate to the full the importance of the orchestra in *Tannhäuser* and similar operas.

At the same time, it is not to be supposed that Wagner himself would be content to hear his lines sung by a fat little man whose voice is no better than his very indifferent acting. Far from it. If grand opera could be organized on the Continental model in this country, our British singers would cause old Wagner's ghost to rise from his grave and call us blessed.

Wagner has had many disciples and imitators. Although his all-round pre-eminence has never been eclipsed, nevertheless there is one composer who has surpassed him in his own special field—in the higher technique of orchestration—namely, Dr. Richard Strauss, at present Director of the opera in Vienna, and formerly Director in Dresden.

Strauss's *Egyptian Helena,* a new opera, was our next experience.

It is impossible to give an adequate description, or write an intelligent appreciation, of this wonderful piece. Unfortunately we were unable to follow the story, though, *mirabile dictu,* it appeared to have a happy ending!

But the whole thing was produced in a marvellous fashion: a feast for the eye, a delight to the ear. As for the orchestra—well—if admiration of this kind of music is confined to the high-brow fraternity, then so much the worse for those without the pale.

Strauss, like Wagner, does not make his special appeal by means of the orchestra alone. A concert hall interpretation of these masters is about as satisfying as an interview with your sweetheart over the telephone. But see a Strauss opera, and hear how every action, word, thought or mood, even the very atmosphere, is interpreted by the orchestra with a fidelity which is startling; that kind of music is GREAT.

At a Continental opera house the bill of fare provides a judicious mixture. The evergreen *Tales of Hoffmann* came at the right moment. A delightful performance in every way. The composer, Jacques Offenbach, was a German Jew, born in Cologne. He came to Paris in his youth, and his operas reflect his own cosmopolitan characteristics.

In "Modern France," a Cambridge University Press publication, edited by Mr. Arthur Tilley (1922), the following occurs :—

> They (the French) have regarded music on the whole in a different way from their neighbours. French music has never had the spontaneous passion of the Italians nor the philosophical meditations of the Germans. . . . One might say that the French have regarded music always as a consciously practised art, and one practised with the principal aim of giving pleasure. At its worst, French music has been frivolous and trivial, at its best intellectual rather than emotional. To the French mind music is a thing apart from reason, and therefore incapable of transcending reason; the only possible relation into which the two can enter is that reason should dominate music.

Generally speaking, this conception is quite different from the Italian point of view, and as the poles apart from the Teutonic. Nevertheless, there has always been an interchange of influences between distinct musical schools. Meyerbeer, Halévy and Berlioz were the musical ancestors of Wagner and Richard Strauss. Mozart was the precursor of Charles Gounod; *Faust* is as much German as French; and Gounod influenced Georges Bizet, the composer of the ever-popular *Carmen*.

The *Tales of Hoffmann*, while full of the gaiety of the Second Empire, is by no means purely Parisian. Nor is it welcomed in Germany for its Teutonic values. Perhaps it most resembles the charming set of lesser operas produced in Vienna in the latter half of the nineteenth century by such men as Suppé and Johann Strauss.

In England, all plays in which the music is "classical" are called grand operas. On the Continent, such plays are divided into two sections: music dramas, and comedies.

The Prophet is tragical, and therefore a music drama: *La Bohème* is romantic, and therefore a comedy; though—as Georgina says—it is difficult to understand why the great majority of Continental musical comedies, or romances, should lead to disaster. And, if any romance merits a happy ending, surely it is that most fascinating of all *La Bohème*. But no: even

poor little Mimi is condemned to a lingering illness and a premature death (Bac. tuberculosis [Koch]).

It has been said that *La Bohème*, badly performed, shows that Puccini was no composer at all; whereas the play, well done, demonstrates Puccini's greatness. Occasionally Fritz makes a really good job of Italian opera: Verdi's *Aïda* at Wiesbaden, *La Bohème* at Dresden. If Puccini's fame depends on the latter production, then it is secure. The general atmosphere was right, the singing was good, and the third act—the winter scene, with snow falling, just inside the gates of Paris—was an artistic and histrionic triumph.

Alas, poor little Mimi!

One evening, by way of relaxation, we deserted the opera house in favour of the concert hall.

The occasion was a guest night, organized by the Dresden Philharmonic Orchestra. The guest was the conductor, an Austrian, and formerly Director of the Court Ball Orchestra at Vienna.

The programme was entirely instrumental, and on popular lines; but the lightness of the items was redeemed by the skill and precision of the playing.

The audience was seated in groups of four, six or eight, at small tables, and the members were all of the working classes. Family parties were common.

Our table was situated right under the conductor's bâton, and consequently our entry, under the escort of the doorkeeper and head waiter, and in full view of everybody, created something of a sensation. As Georgina dislikes publicity, we induced the escort to conduct us to a more remote and obscure place. Sensation repeated.

By the time the orchestra had played half of the overture to *William Tell*, the atmosphere was very thick: Reich cigars; and when the piece concluded there was a general demand for beer.

Throughout the evening the smoke cloud maintained its density; and the intervals between items were always long enough to permit one to acquire another little drink.

Nevertheless, strict sobriety is the rule in Saxony. In Dresden, a hotel-keeper who used to work in Munich complained to me bitterly regarding the sober streak in his northerly clientèle. He seemed to think he had a sympathetic listener, whereas I . . . well, no matter; it is of no interest. Still, it is a fact that there is as much difference between the dour Saxon and the light-hearted Bavarian as there is between winter and spring. In Dresden, you seldom hear a man laugh, just as you seldom see a man drink more than one, or at the most two, glasses of beer at one sitting. In Munich, everybody laughs, and everybody drinks one + x glasses of beer per sitting. The Saxon crowd is one long funeral: the Bavarian crowd is an unending fête—comparatively.

(*To be continued.*)

Editorial.

ON THE STATE OF THE PUBLIC HEALTH.

In pre-war days the reports of the Chief Medical Officer of the Local Government Board were always looked forward to with great interest by members of the medical profession and especially by those who were entrusted with the care of the public health. With the passing of the Local Government Board and the establishment of the Ministry of Health in 1919, the duties of the medical officer to the Ministry were widened, as the object of the new Ministry was to bring together in one administrative organization the powers and duties of the old Local Government Board, the work of the Health Insurance Commission, and the medical services of the Board of Education. Its purpose was "the promotion of the health of the people throughout England and Wales."

The Report of the Medical Officer for the year 1928, presented by Sir George Newman, to the Minister of Health, covers a very wide field and is a fascinating story. Sir George Newman tells us that "*Preventive medicine means the organization of human nurture*—the cultivation and health of maternity, infancy, childhood, adolescence, adult life, old age, the postponement of mortality." The physical advancement and health of mankind is dependent not upon a doctor's stunt here, or a sanitary institution there, but upon the whole social environment and evolution of the people.

Four basic principles must be fulfilled before we can lay sound foundations for a national system of preventive medicine. First, there must be ascertainment and accurate registration of the data obtainable. We must know the census return, the population at risk, the birth-rate, the death-rate, and sickness-rate. Secondly, we must have a standard, not of disease but of health and physiology. We must aim to bring the race, by the individual, to this standard. Thirdly, having the physiological capacity of man as our foundation, we must supplement it by an ever-increasing knowledge of the nature of disease. Lastly, we must have a national organization for applying medical scientific discoveries to the health and well-being of the population.

The population of Great Britain in 1928 was 44,375,000, an increase of 182,000 on 1927. For more than a generation, owing to the falling birth-rates and death-rates, the proportion of children has been decreasing and that of elderly people increasing.

In 1928 the Registrar-General's estimate of population gives 8·1 per cent of children under 5 and 15·8 of persons over 55 years of age, compared with 11·4 and 10·6 in 1901.

The effect of this on the crude death-rate is unfavourable, as a larger proportion of those alive will be subject to higher death-rates.

In 1928 the birth-rate exceeded the death-rate by 5 per 1,000. In 1901 the increase was 11·6 per 1,000, and in 1911 was still 9·7. It seems probable that in a few years the population may become stationary.

In 1928 there were 660,267 births, an increase of 6,095 over 1927, and 460,298 deaths, a decrease of 24,220 compared with the previous year. The number of births has steadily fallen since 1901-10, and reached its lowest figure in 1927. But fortunately there has been a decrease in the number of deaths, and especially of those in children under one year of age.

The principal causes of death were diseases of the heart and circulation, 229 per 1,000 deaths; bronchitis, pneumonia, and other respiratory diseases, 129 per 1,000; malignant disease, 122 per 1,000; diseases of the nervous system, 91 per 1,000; and tuberculosis, 80 per 1,000.

There was a substantial decrease in the incidence and mortality from pneumonia, due to the comparative freedom from influenza in 1928. There was a definite increase in the figures for diphtheria, dysentery, erysipelas and puerperal fever, and a marked increase in scarlet fever, though fortunately the mortality was low. The sickness and invalidity figures indicate the problems which have to be faced. Among the insured population only there was a loss of 26¾ million weeks' work, or the equivalent of twelve months' work of about 514,000 people. The chief causes of sickness were diseases of the respiratory system and diseases of the digestive system.

Sir George Newman then discusses the different aspects of State organization which deal with these matters. He says that Acts of Parliament, bye-laws and regulations are necessary means of government, but it is the people only who can save themselves. Upon their assent, their knowledge and their obedience to the laws of health depend the conquest of disease and the extension of the frontiers of life.

Twenty-five pages of the Report are devoted to maternity and child welfare, and it is sad to note that in spite of all that has been done in the formation of ante-natal clinics and the erection of maternity hospitals, the maternal death-rate in 1928 is the highest recorded since 1911, and there has been no substantial reduction since that year.

In 1928 the Insurance Medical Service completed the sixteenth year of its work. The number of doctors employed in the service was 15,276, and the average number of insured persons on a practitioner's list was 930. While it is important in a service of such magnitude to maintain the highest standard of efficiency, it is alien to the principles of the service that there should be any Government inspection of the clinical work of the practitioners. It is claimed that in panel practice patients receive just as good treatment as any other patients; they are free to select their own doctor and can appeal if aggrieved to the Insurance Committee. Post-graduate study for insurance practitioners is considered of the utmost importance, and arrangements are being made for their attendance at a number of civil hospitals.

The most important event of the year was the passing of the Local Government Act, 1929, which is the fruit of the Royal Commission on the Poor Laws, 1905-09.

The Act contains some far-reaching duties and powers affecting the unification and consolidation of the public health service, the transfer to health authorities of the poor law medical services of the Boards of Guardians and the wider application of preventive medicine to the whole community, including the poor and necessitous. The hospital accommodation of 120,000 poor law beds is now transferred to the County and County Borough Councils for the use of the whole community. After April 1, 1930, Local Authorities will have in their charge some 180,000 beds.

During the passage of the Bill it was said that a general hospital service could not be organized except on the type and basis and traditions of the voluntary hospitals. Sir George Newman says there is some truth in this contention, and the history of voluntary hospitals since the eighteenth century illustrates the point. Voluntary hospitals and dispensaries were founded because the State through its Poor Law institutions could not meet the needs of the time. Voluntary hospitals are constructed and maintained by voluntary contributions and governed by voluntary boards of management. In the nineteenth century, however, the State or municipality had to provide hospital accommodation for the isolation of infectious persons, for maternity cases and for the treatment of disease. Under the supervision of Local Sanitary Authorities there are now 36,000 fever beds, 2,600 maternity beds, and 21,000 sanatorium beds for tuberculosis. Thus two hospital systems, voluntary and State, grew up side by side.

According to Sir George Newman, it is futile to assume that medical education cannot be associated with State hospitals or that they are inferior in staffing and government. It is idle to suppose that personal devotion and self-sacrifice cannot be practised in municipal as in voluntary hospitals. There is no reason why the high traditions of voluntary hospitals should not become widely established in municipal hospitals free from the taint of "pauperism."

The Act does not indicate a further encroachment by the State in the province of medical institutions. It puts the Poor Law hospitals under the larger Health Authorities rather than under the guardians of the poor, and associates them for the first time with the other medical services of the locality. The new Act does not of itself break up the Poor Law, but "it furnishes the local organization by which the Poor Law medical work may be reformed and woven into the warp and woof of the other public medical services."

Under the section devoted to General Epidemiology we are told that the outstanding events in the records of infectious disease during the year 1929 were the continued prevalence of smallpox, the notification of an unusually large number of cases of scarlet fever, and during the winter, 1928-29, a widespread epidemic of influenza.

In 1928 there were 12,420 cases of smallpox which occurred in forty-eight counties in England and Wales, but the disease was only allowed to become prevalent in six of them.

As regards the vaccinal condition of 1,452 cases in certain areas, it is interesting to note that only five of the 462 cases successfully vaccinated contracted the disease under 15 years of age. There were only 13 cases in the successfully revaccinated, and these were at ages from 40 to 80 years. Of the 955 unvaccinated cases, 532 under 15 years of age contracted the disease.

The type of the disease was mild and the mortality low ; only fifty-three deaths were classified by the Registrar-General as due to smallpox. Even in confluent cases the symptoms were comparatively mild and few proved fatal.

Control of the disease was easy when cases were notified, but owing to the mildness of the disease medical advice was often not sought and cases were overlooked. The great danger is that the mild form may prove to be only a temporary phase in a biological cycle of the severe type. In any case it leads to industrial loss and international misapprehension such as recently occurred in France.

In an editorial on vaccination we gave a summary of the Report of the Committee on Vaccination, published in July, 1925, and a vaccination order giving effect to some of the recommendations is now in preparation.

With regard to the nervous phenomenon following upon vaccination, from 1922 to 1928, 175 cases of "post-vaccinal nervous disease" have occurred among 5½ million persons vaccinated, that is, three per 100,000 vaccinated. Sir George Newman appears to think that the notifications are "under the mark," and for two reasons: Firstly, we do not know the bacteriology of smallpox and have no definite test like the finding of *B. diphtheriæ* or *B. tuberculosis*; and secondly, the clinical type of the disease is not sufficiently definite to ensure an accurate diagnosis. This may be so, but we are evidently dealing with a very small group of cases which have chronologically followed but are not necessarily peculiar to vaccination.

Similar nervous cases have occurred after influenza, measles and whooping-cough. It is the dramatic suddenness of the attacks in persons in perfect health which has so alarming an effect on the general public, and which is ever increasing the prejudice against vaccination. Intensive research on the subject is evidently necessary, and we are glad to know that Professor de Gros Clark has been investigating the route by which a virus might reach the brain, and that his report is in course of preparation for publication.

Scarlet fever continues to be a mild disease, and more use is being made of the antitoxin, and experience shows that it reduces the tendency to complications and thus shortens the average duration of stay in hospital. Active immunization with the toxin has proved effective in protecting the staffs of hospitals, but the number of doses required makes its general adoption impossible.

Measles continues to be second only to whooping-cough as the most fatal disease of childhood. The serum of convalescent patients has been found very effective in prevention, after exposure to infection. A dose of 3 to 5 c.c. injected intramuscularly before the sixth day will confer complete protection for about three weeks. The serum is being used in many hospitals, and especially at Great Ormond Street. When a case occurs in a ward the contacts are at once treated, and the spread of infection may be entirely prevented.

At the close of 1928 and the beginning of 1929 there was a recrudescence of influenza. There was no warning in the shape of marked prevalence of colds and coughs which usually precede an epidemic. There was, however, a severe outbreak in the United States in November and December, 1928, and it is thought that the epidemic in England might have been due to a virulent influenza strain introduced from America.

In 1928 there were 36,623 deaths from tuberculosis, as compared with 38,137 in 1927. Since 1911 the gross death-rate from pulmonary tuberculosis in males has fallen from 1,233 per million to 879, and in females from 920 to 641. In non-pulmonary tuberculosis the male death-rate has fallen from 436 to 188, and the female from 378 to 159.

In England the Ministry have approved 211 institutions of local authorities containing 14,856 beds, and 283 voluntary institutions containing 8,404 beds, for the treatment of tuberculous patients.

The Insurance Act of 1911 precluded local authorities from making use of Poor Law institutions for their tuberculosis schemes. Under the Local Government Act of 1929, local authorities will have a free hand and can revise their schemes so as to make use of all beds available.

The Chief Medical Officer mentions that in his last Annual Report a summary was given of the progress made in Professor Calmette's prophylactic vaccination of the newly-born against tuberculosis. An international conference was held at Paris in October, 1928, to which Professor Calmette presented a lengthy report on the subject of B.C.G. Up to November 1, 1928, 116,180 children had been vaccinated in France with B.C.G. Up to July 1, 1928, 3,607 children thus vaccinated were born of tuberculous mothers or lived in contact with persons suffering from active tuberculosis. The tuberculosis mortality from one month to one year was 1·5 per cent, and from one to four years 0·3 per cent. Professor Calmette has also obtained returns from 204 dispensaries which give observations on 1,989 children born of tuberculous mothers, who were neither isolated nor vaccinated. These have shown a mortality from tuberculosis of 18 per cent instead of 2·4 per cent in vaccinated children, and a general mortality of 24·3 per cent instead of 10·4 per cent. given by the vaccinated. Professor Calmette claims that B.C.G. has reduced the tuberculosis mortality by more than three quarters and the general mortality by one-half. The figures are small and efficient controls are most necessary. Professor Greenwood has criticized the figures adversely, as Calmette's mortality figures do not apply to England and Wales, Denmark and Sweden.

An interesting report on the fate of young children living in tuberculous households has been issued by the Lancashire group of tuberculosis officers. This report shows that Calmette's calculation that twenty-four per cent of the children in France born of tuberculous mothers die from tuberculosis is many times higher than the Lancashire experience The death-rate from tuberculosis for corresponding children in Lancashire was only 3·2 per cent, and from all causes the rate was only 11·5 per cent. Among Lancashire children observed from birth to 4 years of age there was a death-rate from tuberculosis and from all causes lower than the French figure for children observed from 1 month to 4 years vaccinated with B.C.G., and much lower than the French children not vaccinated with B.C.G. In the light of this evidence the question of B.C.G. must be regarded as still *sub judice.*

B.C.G. is a living vaccine, and research carried out for the Medical Research Council by Dr. Stanley Griffiths has not confirmed Calmette's conclusion that ingestion or inoculation of B.C.G. protects monkeys against virulent tubercle bacilli.

Dr. Petroff, of the Edward L. Trudeau Foundation, U.S.A., has found that inoculation of animals with B.C.G. has given rise to generalized tuberculosis. He refuses to admit, as Calmette suggests, that this result is due to contamination of B.C.G. with virulent tubercle bacilli. In his experiments he found in B.C.G. cultures R (resistant) colonies which were non-virulent and S (sensitive) colonies which were virulent. By culture on potato-bile media the S colonies were practically eliminated, but some might remain and cause tuberculosis when injected into animals. Petroff believes that in the body the R colonies may possibly mutate into the S variety. He also claims that the protection given by B.C.G. is no greater than that produced by heat-killed bacilli.

Cancer shows an increase in the recorded mortality-rate. In the five-year period, 1847-50, the rate per million was 274, in 1901-05 it was 867, in 1921-25, 1,269. Since 1921 the rate per million has been given for single years, and it has steadily increased from 1,215 in 1921, to 1,428 per million in 1928. This increase cannot be due solely to better diagnosis and certification. The scientific aspects of the causation are being investigated by an increasing number of workers, and the social and economic side has been taken up by the Committee of Medical Officers of Health working in conjunction with the Cancer Committee of the Ministry. Fairly complete information as regards cancer of the breast, uterus and rectum has been obtained which will be very useful to public health authorities when they take over hospitals in which cancer cases are treated.

The figures obtained seem to show that the yearly incidence of the disease is for any given organ almost always the same. If some general factor were of importance one would expect its effect on neighbouring areas to be of the same order. But this does not seem to be the case. Cancer of the tongue is four times as frequent as of the lip, and nearly twice as

frequent as in other parts of the mouth cavity. Cancer of the skin in some part, especially from local irritants, is frequently met with, but it is never found on the palms of the hands or the soles of the feet, and the heart and the spleen are never the seat of malignant growths. That there must be a general factor as well as a local cannot be doubted, but its nature is not yet understood.

The remaining sections of the Report deal with venereal diseases, the relation of food to health and disease, the work of the Ministry's pathological laboratory, acute rheumatism, undulant fever, and the hygiene of swimming baths. For the purification of water from swimming baths, filtration through pressure filters, after the addition of a coagulant, and chlorination of the effluent to the extent of 0·2 to 0·5 parts per million, preferably by means of chlorine gas, are recommended.

Clinical and other Notes.

A CASE OF POST-VACCINAL TRANSVERSE MYELITIS.

By Major H. G. PEAKE,
Royal Army Medical Corps.

The case of transverse myelitis described below is published on account of the interest attached to it owing to its probable connexion with vaccination.

January 23, 1929: The patient, a girl, C. M., aged 8, was admitted to the Military Families Hospital with pains in the abdomen, head and neck.

Previous History.—Headaches and general malaise for four days previous to admission. Twelve days previous to admission had been successfully revaccinated with calf lymph on the left thigh. Nothing else of interest.

On Examination.—Child rather drowsy with slight retraction of head. Neck muscles tender to pressure and movement. Eyes normal, pupils equal and reacting to light. Tongue furred and dirty. Abdomen distended, due to full bladder. (On inquiries, bowels not open for forty-eight hours and no urine passed for twenty-four hours.) Movement of legs painful, but particularly at knee-joints. No swelling of joints. Kernig's sign present. Other reflexes—nothing abnormal. Temperature 100° F., pulse 98.

Symptomatic treatment.—Catheterization was necessary—twenty-five ounces. In the evening, temperature 100° F., pulse 104. Very drowsy and there seemed more head retraction. Lumbar puncture and about 1½ cubic centimetres cerebrospinal fluid dripped out—not under pressure.

January 24: Laboratory report on cerebrospinal fluid, negative for Gram-negative diplococci.

Laboratory report on urine, 1020. Slightly acid, albumin nil. Sugars nil.

No change in condition of child.

Fifteen cubic centimetres antimeningococcal serum given subcutaneously followed by a reaction in the evening of temperature 101° F., pulse 128.

January 26 : Condition continued much the same. Daily catheterization necessary, also no bowel action without enemas. Aperients by mouth having no effect. The antimeningococcal serum given daily for three days. Urotropine by mouth and symptomatic treatment.

January 26 : Examination of body shows a condition of flaccid paralysis of all muscles of legs. Loss of all reflexes in legs. There is also loss of sensation to pin-pricks, heat and cold over both legs and lower abdomen up to an area just above the umbilicus. A fairly definite ring could be marked out round the body. No girdle pains. Having no apparatus, it was not possible to test the electrical reaction.

January 28: The area of anæsthesia on abdomen seems to have lessened, the upper edge having descended to below the umbilicus. Bladder and bowel conditions still remain the same.

The patient is fairly comfortable and takes fluids well, but continually complains of pains in the legs, particularly on their being moved.

Temperature is irregular, varying between 97·4° and 101° F. Pulse between 96 and 118.

Has lost the drowsiness and there is practically no head retraction now.

Urine 1010, slightly alkaline, albumin, staphylococci, streptococci, numerous pus cells and Gram-negative bacilli present. Antiseptic urinary treatment given.

February 4: Area of anæsthesia lessened. Pin-pricks can be felt and distinguished down to about the lower third of thigh. No change in muscular condition. Bowel and bladder conditions remain the same.

February 6: Previous evening temperature 102° F., pulse 132. Temperature 102·4° F., pulse 124. Child fretful, refusing food, complaining of abdominal pain and pains in legs.

February 9: Still high irregular temperature. Urine foul smell—S.G. 1012, alkaline, albumin present, pus cells and the Gram-negative bacilli are markedly increased. Patient given a course of caprokol (hexyl resorcinol) and a B.C.C. vaccine is to be made from a urine culture.

February 13: Irregular pyrexia still present, and condition of urine, bladder and bowels remains the same.

Area of anæsthesia lessened. Pin-pricks can be distinguished about the knee-joints. Still complains of pains and tenderness to slight pressure of muscles of legs.

February 18: Has been a gradual decline in the temperature. Since February 16 there has been incontinence of urine and occasional incontinence of fæces. The muscle pains in legs have been very severe.

February 21: Can now distinguish sharp from blunt (with pin) about the ankle-joint and has made slight movement at the ankle-joint. No signs of normal reflexes.

The B.C.C. vaccine was given in gradually increasing doses at five-day intervals, with gradual but continuous improvement in the condition of urine.

The anæsthetic condition gradually disappeared until March 12 she could distinguish between hot and cold on both feet and legs. Also slight movements at knee- and hip-joints, though they caused a fair amount of pain. About this time she began to ask for the urine bottle and made proper use of it. General condition improving—eating and sleeping well. By April 7 the urine was quite clear and no incontinence. Daily massage was administered but this, if heavy, caused much pain in the legs afterwards. She was soon able to raise legs from the bed, and on April 14 a slight knee-jerk was obtained on right leg. Still some fæcal incontinence, April 27. With slight support on both sides could stand up and walk a short distance.

A few days after this, having been medically boarded, she left the station for the United Kingdom.

This child was one of twelve cases (adults and children) that were vaccinated on the same day and from the same batch of lymph. There have been numerous cases of affection of the central nervous system as a sequel to vaccination reported in the United Kingdom, but I have not heard of one before in Egypt.

The report of the investigations of a committee, formed by the Ministry of Health in 1923, stated that there appeared to be no connexion between vaccination and the diseases of the central nervous system under investigation.

It seems, however, from the cases of more recent dates which have been published from time to time that this decision will to some extent have to be revised. In the case I have described no other cause for the symptoms could be discovered with the exception of the recent vaccination. This also seems to be borne out by the rapidity and completeness of the recovery, indicating, as it appears to do, a transitory cause of so short a duration as to leave no permanent effects.

I am indebted to Lieutenant-Colonel L. V. Thurston, D.S.O., R.A.M.C., Officer Commanding, Military Hospital, Moascar, for permission to publish these notes, and also to Major W. M. Cameron, O.B.E., R.A.M.C., Medical Specialist, the British Troops in Egypt, for advice in treatment of the case.

A SIMPLE METHOD FOR ESTIMATION OF QUININE SALTS IN STOCK SOLUTIONS.

By Captain R. C. WATS,

Indian Medical Service.

The keynote in the treatment of malaria is to ensure that the patient gets the prescribed amount of quinine salts. Many instances are on record, where the apparent failure of quinine in the treatment of this important tropical disease was found to be due to the mixtures being under strength. The appalling state of affairs as to the quinine content of the mixtures used in civil hospitals of India was revealed by Colonel Megaw and his collaborators, in the two papers published in the *Indian Medical Gazette* [1] and [2]. The simple method for the estimation of quinine salts published in the first paper was adopted in several of the brigade and district laboratories in India. When the quantities were very much below the standard, the results were obvious, but where the variation was slight, an accurate chemical analysis was essential.

The following method may be useful to officers in charge of military laboratories, as it requires no special extra apparatus or reagents, and it can be carried out with the available facilities, just as easily as a milk-fat

estimation. For those who are not familiar with chemical tests, a qualitative test for quinine is given at the end of the paper.

(*a*) *Apparatus.*—(1) An accurate chemical balance; (2) Stokes' tube (used in laboratory for estimation of milk fat).

(*b*) *Re-agents.*—(1) Ether purificatus and petrol-ether or petrol; (2) normal sodium hydroxide solution; (3) phenol red as indicator (commonly used as 0·01 per cent solution in distilled water for determining the pH of laboratory media, or in preparation of "phenol milk")—if not available, litmus solution may be used. Method consists of three parts.

(1) Into a test tube fitted with a cork (not rubber, ordinary cork covered with silver paper serves the purpose), pour about fifteen cubic centimetres of the solution of quinine to be tested. Add about ten cubic centimetres of the petrol-ether (ordinary petrol may be used for the purpose), cork the tube and shake well. Stand the tube in a rack for fifteen minutes or so to allow the ether to float above the layer of the mixture. Pipette off the supernatant ether and some of the top part of the mixture so as to remove the last traces of petrol-ether. This removes the various ether-soluble factors present in the mixture. The mixture commonly used in military hospitals contains Tr. aurantii, the essential oils of which are soluble in ether and interfere in the final estimation of quinine. This procedure, however, does not remove quinine salts present in the mixture.

(2) In a Stokes tube, place ten cubic centimetres of the above ether-extracted mixture and add two or three drops of phenol red solution (or a drop of litmus solution). Now add from a burette normal sodium hydroxide solution until the solution is distinctly alkaline, and make up the volume in the tube to twenty cubic centimetres or some other definite mark with distilled water, if necessary. The amount of N/1 NaOH used will depend on the acidity of the solution, stronger solutions of caustic soda may have to be prepared, as it is not desirable to increase the volume much above the twenty cubic centimetre mark (this will rarely be necessary). Now fill up the Stokes tube with ether accurately to the fifty cubic centimetre mark, and cork (ordinary cork covered with silver paper serves the purpose). Invert the tube ten or fifteen times to allow the ether to take up the quinine from the mixture. Set aside the tube for the ether to separate, and read off the amount of ether, counting three quarters of the fluffy layer (if any) at the bottom of the ether column, as ether.

(3) Transfer twenty cubic centimetres of the ether to a weighed basin, evaporate to dryness over a water bath and transfer to the incubator for twelve to twenty-four hours. Instead of a water bath, a Quaker oat tin, filled with hot water and fitted with a concave lid into which the basin containing ether can be conveniently placed, is preferable. This arrangement permits the ether to evaporate easily and does not moisten the bottom of the basin. The basin can be finally dried by transferring it to the incubator for twenty-four hours or so.

The weight, less the weight of the basin, represents the amount of

quinine base recovered from the mixture. Knowing this for twenty cubic centimetres of ether, that in the whole column of ether, i.e., in ten cubic centimetres of the mixture under analysis, can be calculated, and the amount contained in an ounce worked out.

The amount of alkaloid quinine contained in quinine sulphate is 73·5 per cent (calculated chemically from the formulæ of quinine sulphate and of the alkaloid itself), hence the amount of quinine sulphate dispensed can be calculated by simple rule of three. The following example will make this clear :—

Weight of basin plus residue left after evaporation of 20 c.c. of ether from the Stokes tube	17·605 grm.
Weight of basin	17·505 ,,
Amount of quinine base in 20 c.c. ether	0·1 grm.
The amount in 29·4 c.c. of ether (column in Stokes tube) or in 10 c.c. of the mixture	0·147 grm.
Therefore in 100 c.c. the amount of quinine base is	1·47 ,,

To calculate the amount of quinine sulphate we apply the above rule, i.e., 73·5 parts of quinine base represent 100 of quinine sulphate.

$$73{\cdot}5 : 1{\cdot}47 :: 100 : x = 2$$

(The amount of quinine base in 100 c.c. multiplied by 1·36 will work out the result fairly accurately.)

The proportion of quinine base contained in quinine hydrochloride and bihydrochloride is eighty-one per cent and seventy-two per cent respectively. The amount of the salt contained in the mixture will have to be calculated in a similar way.

A standard solution should be made and tested to get a little practice with the method. For absolutely accurate estimations, the basin with the residual base should be dried repeatedly until it gives a constant weight. Any results which seem abnormal should be checked against a known mixture. In actual practice, I have found that dispensary balances, when compared with accurate chemical balances, give, on an average, an error of ten per cent over or underweight.

In conclusion, I wish to thank Colonel H. E. M. Douglas, V.C., D.S.O., Commandant R.A.M. College, Millbank, S.W.1, for permission to work at the College Laboratories, and Major S. Elliott for his helpful suggestions.

REFERENCES.

[1] MEGAW, GHOSH and CHATTERJEE. *Ind. Med. Gaz.*, May, 1928, 244.

[2] MEGAW and HAWLEY. *Ibid.*, July, 1929, 378.

To Test for Presence of Quinine.[1]—Take about two cubic centimetres of the mixture (diluted one in twenty) in a test tube, add some bromine water (can be made by dissolving a bromine capsule used for urea estimation in urine in about 100 cubic centimetres of water) and drop into the tube a few drops of liqr. ammonia. If quinine salts are present, a green colour develops.

[1] "Muters' Short Manual of Analytical Chemistry," by J. Thomas. 1928 Edition, p. 86.

Travel.

KASAULI—A STUDY IN CONTRASTS.

By Major S. SMITH,
Royal Army Medical Corps.

Kasauli, which lies on the outer fringe of the Himalayas at a height of 6,000 feet, is one of a small group of similar Hill Stations which includes also Dagshai (5,800 feet), Subathu (5,100 feet), Solon and Jutogh, all lying on neighbouring hill tops, and, with the exception of Solon, easily visible from Kasauli.

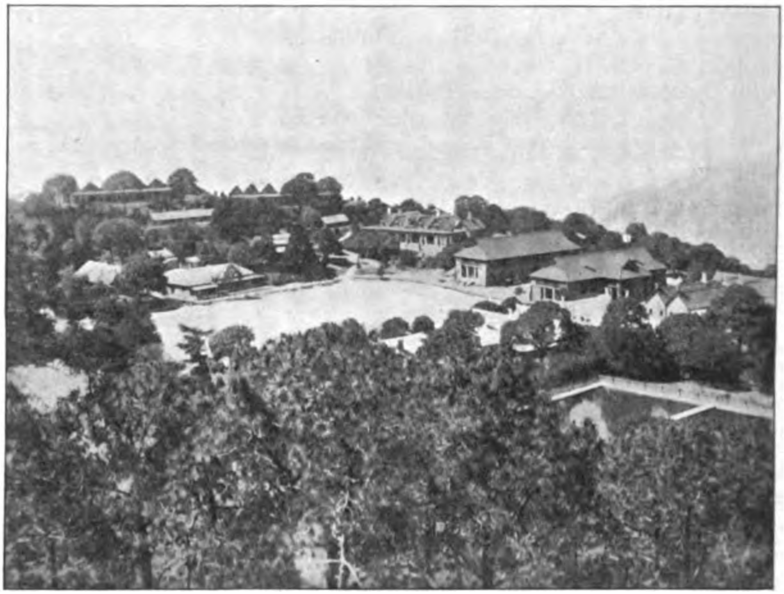

Fig. 1.—Kasauli. Bird's eye view of Barracks and Parade ground. To the right are seen the two large water tanks.

Kalka, a small and uninteresting town of some local importance, lies at the foot of the Kasauli Hill. It is situated on the cart and motor road between Simla and Ambala and forms the connecting link between the broad-gauge railway system of the plains of India and the wonderful little narrow-gauge Kalka-Simla railway which was first opened up for passenger traffic on November 9, 1903. The construction of this railway was no mean engineering feat.

"Between Dagshai and Solon the railway pierces the Barogh Hill[1] by

[1] It is the Barogh Hill that hides Solon from Kasauli.

a tunnel 3,760 feet long, situated 900 feet below the cart road. Throughout its length of 60 miles it runs in a continuous succession of reverse curves of 120 feet radius in and out along the valleys and spurs, flanking mountains rising to 6,000-7,000 feet above sea level, the steepest gradients being 3 feet in 100. The works of construction involved are of the first magnitude, comprising 107 tunnels, aggregating 5 miles in length, numerous lofty arched viaducts, aggregating 1¾ miles, and innumerable cuttings and stone walls."[1] The equally daring enterprise, the Kalka-Simla cart road (58 miles), originally called by the somewhat resounding title of the Grand Hindustan and Tibet Road, was finished in 1856. Prior to the completion of this road Simla was reached from the Plains by a more direct but poorly graded bridle-path, passing up through Kasauli, Kakkarhati, Hurreepore, and Syree, a total distance, up hill and down dale, of 43 miles. The gradients of this track were too stiff and the surface too bad to allow of any other means of transport than Jampans (sedan chairs fitted with curtains) for the women and children, ponies for the men, and doolies (light stretchers with canvas coverings) for invalids; porterage of heavy luggage was by coolie or pack-pony.

The section of this track from Kalka to Kasauli (9 miles), and on to Subathu, 9 miles further, is still much used for pack-pony transport, etc., but most visitors prefer to make the journey up to Kasauli either by motor from Kalka (22 miles), or to Dharampore by train and thence by the branch road (8 miles) to Kasauli.

History.

Prior to their defeat by Sir David Ochterlony's British force in 1815 and subsequent surrender the Gurkhas had enjoyed a reign of terror and oppression over the Simla Hill district, and by the year 1808 from their capital at Arki (near Simla), had subdued the greater part of the country lying between the Jumna and the Sutlej, including Kasauli and its neighbourhood. The people in their wretchedness applied to the British for protection, but it was not until after fierce fighting and bloody battles, one of them in the near vicinity of Kasauli, that the "little men from Nepal" were finally subdued. The Gurkha rule while it lasted was ruthless and cruel and it is said that they spared no one.[2] Subathu and Kotegarh (beyond Simla) were established by us as frontier posts in 1815 and there is a legend that the British officer in charge of a Gurkha guard, while on the march between these two posts, encamped on the site of where Simla now stands, then a small village, and noted its coolness and suitability as a military station.[3]

The hill tops in the vicinity are still studded with ruined Gurkha forts, and there is one in a better state of preservation than most near the

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[1] "Simla Past and Present." P. 18 by E. J. Buck, C.B.E.

[2] Other accounts challenge this statement.

[3] This version of the origin of Simla has also been challenged.

parade ground at Subathu, a memento of its former rulers. The site of what is now Kasauli was first surveyed in 1840 by Colonel Tapp,[1] the political agent at Subathu, with a view to its possibilities as a military hill station. His report was evidently satisfactory, as the first bungalows were built in the station about that date, amongst the earliest of which was Sunnyside, built for Sir Henry Lawrence of Punjab fame, and overlooking his daughter's grave at Subathu. Military building operations actually commenced in 1842, and in 1843 the first British troops, the 13th Infantry (Somerset L.I.), arrived in Kasauli straight from service in Kabul.

The neighbouring cantonment of Dagshai, 10 miles away to the north-east, was commenced in 1846 and first occupied by troops in 1850.

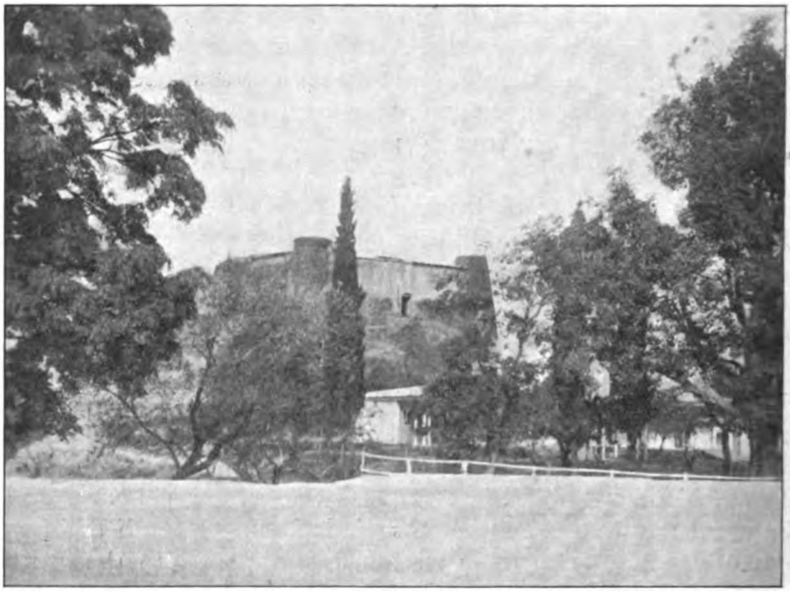

FIG. 2.—Gurkha Fort near Parade Ground, Subathu.

The Lawrence Military School, formerly known as the Lawrence Military Orphan Asylum, was founded at Sanawar (2 miles from Kasauli) in 1846, the actual building operations being under the supervision of Lieutenant Hodson (later Hodson of Hodson's Horse).

Kasauli, apparently, has enjoyed a fairly peaceful existence since its foundation nearly ninety years ago, and, judging by the graves in the old cemetery (*vide infra*), was used then, as now, largely as a sanatorium for officers and men recovering from the effects of wounds or sickness incurred during the course of one or other of our frequent frontier campaigns.

The station in common with most other military stations in northern

[1] Hence Tapp's Nose, a prominent landmark at Kasauli.

India, which were necessarily largely depleted of British troops for the common weal during the mutiny, had its moments of acute anxiety and danger during those stirring months; luckily, however, the authorities on the spot acted with wise discretion during a difficult situation, and there was no loss of life.

The first news of the outbreak of the mutiny at Meerut on May 10, 1857, reached Kasauli the following day, and on May 13 and 14 the British regiments from Kasauli, Subathu, and Dagshai marched down the hill to Ambala, later to form part of the famous Delhi Field Force, only leaving behind weak detachments. At Kasauli there were left remaining seventy men, mostly invalids of H.M. 75th Regiment (the Gordon Highlanders) to

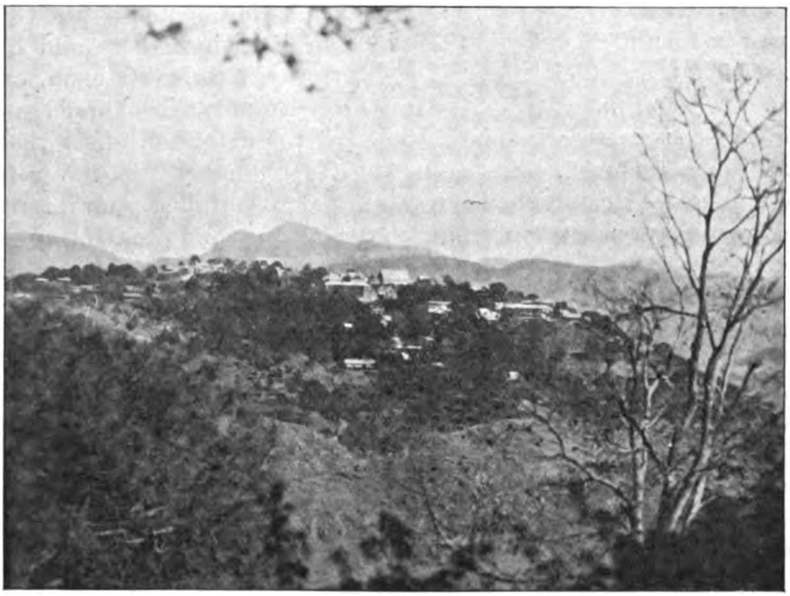

FIG. 3.—Lawrence Military School, Sanawar. Bird's eye view from Kasauli.

guard a total of some 600 Europeans, mostly women and children, at Kasauli and Sanawar. On May 16 the Gurkha guard in charge of the treasury became insolent and somewhat mutinous, and looted the treasury of some Rs. 26,000 which had been placed in their charge. The officer commanding the Station was actually in the process of falling-in an armed party of the 75th, amounting to thirteen or fourteen files, to deal with the mutinous soldiers, when he was met by the cantonment magistrate, who dissuaded him from precipitate action, stating that, if blood were shed at Kasauli, the lives of British women and children at Simla would be in grave jeopardy. These remarks had the necessary calming effect, the British troops were ordered to act on the defensive only, and the mutineers decamped with their loot.

All kinds of wild rumours, many of them quite untrue, had been filtering in from Simla, to the effect that the Gurkhas of the Nusseree regiment at Jutogh were in open revolt, that the Simla treasury and Bank were in their possession, and that Simla and Jutogh were at their mercy, etc. Three excited officers had arrived in Kasauli only that very morning "armed to the teeth with double-barrelled guns, pistols and swords," who confirmed the rumour concerning Simla, and added that a number (supposed to be 250 men) of the same regiment were on their way to Kasauli from Harripore and might be expected to put in an unwelcome appearance during the day.

It was on the strength of these greatly exaggerated reports and fearing for the white population of Simla, that the cantonment magistrate issued his warning. It was rumoured later that the treasure looted by the Gurkha guard was in turn filched from them by two British soldiers and hidden under a tree in Kasauli churchyard. Many years later a chaplain, on the strength of a letter purporting to have been written by a discharged soldier,[1] dug under a certain tree in his churchyard to such good effect that the tree had to be removed, but the treasure (presumably) was never found.

There is an old cemetery at Kasauli which contains some interesting historical associations and in which many Mutiny and pre-Mutiny graves may be seen. The earliest decipherable epitaph is that of an officer: "The life of this most amiable and promising officer was spared in the battlefield but he fell a victim to the climate of India 29th July 1846." Close by are the graves of officers who died from the effects of wounds received at the battles of Sobroan (1846) and Chilianwala (1849).

One interesting inscription runs thus :—

" ———— late Captain in Her Majesty's 75th regiment. This brave and devoted soldier departed this life at Kussowlie on the fourth day of October 1857. He died of wounds received in action before Delhi against the mutineers of India on the 13th September 1857 the night previous to the successful assault by the victorious British Forces. His life was exposed to danger, hardship, trial and privation cheerfully endured in a good cause from the 8th of June when the memorable battle of Budliki-Serai was fought and won to the day of his death."

A noble epitaph of which any soldier might be proud.

One can imagine the poor fellow rushed up to Kasauli from the burning plains of Delhi in the hope that if his life could not be spared he might at least die in peace amongst the calm and beautiful surroundings of this Himalayan Hill Station.

Officers and men from the following regiments lie buried in this old graveyard :—

H.M. 29th Regiment (Worcesters), 1847-1848; H.M. 50th Regiment

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[1] History does not relate if the letter was written by one of the two soldiers who actually buried the treasure.

(Queen's Own), 1846; H.M. 13th Regiment (Somersets), 1848; H.M. 61st Regiment (2nd Battalion the Gloucesters), 1852-1857; H.M. 75th Regiment (Gordons), 1857; H.M. 32nd Regiment (D.C.L.I.), 1851-1856; H.M. 59th Regiment (2nd Battalion East Lancs.), 1859.

It does not follow that all the above regiments were ever stationed at Kasauli although some of them undoubtedly were. In many cases sick and wounded were sent up from units on the frontier or in the plains to recuperate amongst the pine woods of "Kussowlie." A certain number amongst those buried in this graveyard died at Kalka. I have been unable to ascertain if they died on the line of march or if there was some sort of military encampment or station at Kalka during that period. There is certainly no permanent military organization, beyond a few police, at Kalka nowadays.

Medical Institutions.

It is possibly not realized by those who have never visited the station what an important centre of medical research Kasauli is.

The first of the medical scientific institutions to be established here, the Pasteur Institute, the first of its kind in India, was opened in 1900, with Major D. Semple, R.A.M.C., as its Director. During its first year of activity 321 persons received anti-rabic treatment; twenty years later the numbers treated annually had swollen to 7,506; to-day 300, of all creeds and nationalities, receive treatment every day of the year.

In 1906, the Central Research Institute of India, also with Major Semple as its first Director, was established in a bungalow situated on a magnificent site and presented by the Khan Sahib of Patiala "for the conduct of research into disease."

During the twenty years of its existence an immense amount of research work, much of it recorded in their official organ, the *Indian Journal of Medical Research*, has been carried on at the C.R.I.

The institute has earned an international reputation, and research workers from all over the world are to be found there from time to time.

Two years ago the famous French scientist, Dr. d'Herelle, paid a visit to Kasauli to investigate the possibilities of the bacteriophage in the treatment and prophylaxis of cholera and the dysenteries, and last year a Russian disciple of his was engaged in similar investigations.

During and since the war the manufacture of vaccines and sera on a large scale for distribution all over India has also been carried on at the C.R.I. In an adjoining building, and recently placed under a separate Director, is the Malaria Survey of India, formerly known as the Indian Malaria Bureau, the Headquarters of Malaria Research in India. The type collection of Indian mosquitoes laboriously collected by Lieutenant-Colonel Christophers, C.I.E., I.M.S.[1] and his co-workers is probably one of the finest of its kind in the world.

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[1] The present Director of the Central Research Institute and formerly in charge of the Malaria Bureau.

In addition to the above, which are now under the directorship of and staffed entirely by I.M.S. officers, there are three important institutions commanded by R.A.M.C. officers and directly under Army Headquarters, Simla. These are (1) the *Food Laboratory*, started during the late war for the scientific analysis of the soldiers' food, and which has carried on this important function ever since. (2) The *Enteric Convalescent Depot* transferred from Naini-Tal early in 1928, which has a very fine laboratory well equipped for its special functions. (3) *The Malaria Treatment Centre*, an adjunct of the B.M.H., where new methods in the treatment of chronic relapsing malaria receive a thorough "try out" under rigid scientific control. Kasauli is also of some additional interest to our Corps in that it boasts one of the very few if not the only civil surgeoncy in India reserved for R.A.M.C. officers.

Climate.

The climate is that common to most Himalayan hill stations.

The annual rainfall averages sixty-one inches, most of it during the monsoon months of July and August. There is usually one fairly heavy fall of snow during February which disappears in a few days, but producing some very beautiful snow effects, both distant and near, while it lasts.

There are, roughly, four seasons :—

(1) *January—March*.—Cold, windy, wet under foot, with occasional falls of snow and heavy hail storms, the latter of which cause the tin roofs of the bungalows to leak like sieves; some two days in every week are gloriously fine though cold.

(2) *April—mid July*.—Gradually increasing heat (to a maximum shade temperature of about 95° F.), rainless and very oppressive just before the monsoon breaks. During these months the grass and vegetation gradually dry up (though to a lesser degree than in the plains below), the pine needles cast from the numerous pine trees carpet the ground and the dread of a hill fire is ever at hand. This is a very real danger towards the end of the dry season and immense damage may be done by a match or cigarette carelessly thrown down amongst the inflammable dried grass or pine needles. A picket is always ready warned to deal with these hill fires and there is a special bugle "call" provided.

(3) *Mid-July—End of September*.—Monsoon months; tremendous spates of heavy rain; days on end when the country is bathed in rolling mists, reminding one, but for the colour, of a London "pea-souper"; glorious cloud-effects and occasional bursts of bright sunshine, maybe lasting a day or two and providing views of unsurpassed beauty. From the commencement of the rains vegetation springs into life again, the pine trees are covered with vigorous young shoots, the hill slopes are clothed in a green mantle of fresh young grass and growing crops, mostly maize; and wild flowers, especially the semi-wild dahlias, a feature of Kasauli, cover the khud side with their wonderful range of colour.

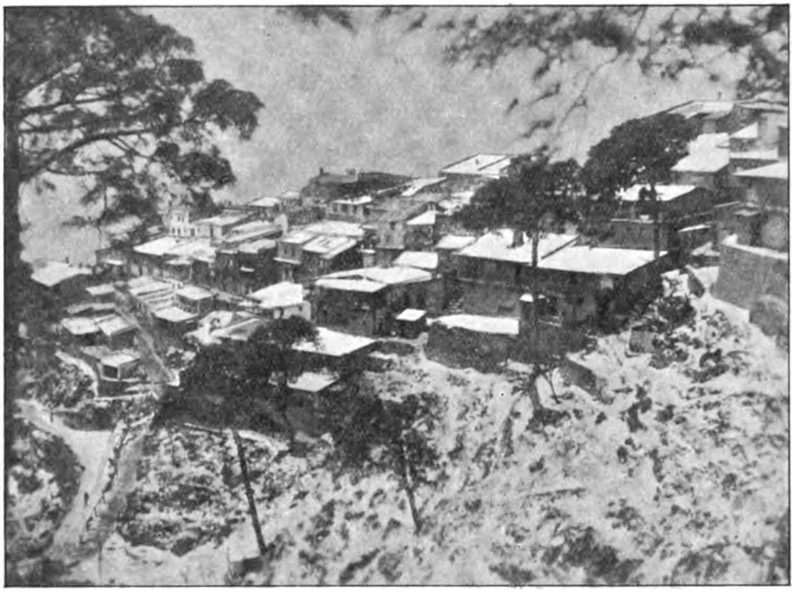

Fig. 4.—Kasauli Bazaar. Winter.

Fig. 5.—Kasauli under snow. Terraced slopes used for cultivation well seen.

(4) *October—December. Glorious.*—These to my mind are *the* months *par excellence* for sheer enjoyment and *joie de vivre* at Kasauli. The air has a champagne-like quality absent at other seasons. The countryside is radiant after the rains. The maize has ripened in the fields which resemble great carpets of burnished gold, or has been garnered and is lying on the cottage roofs, dyeing them a rich coral. The innumerable wild cherry trees are, by some perverse law, in full bloom during November, during which month Kasauli appears full of fragrance and blossom. The distant views, too, are superb at this season, and the extensive stretch of plains to the south afford a striking contrast to the northern tumble of hills with their wonderful background of snow-clad peaks lying far beyond Simla,

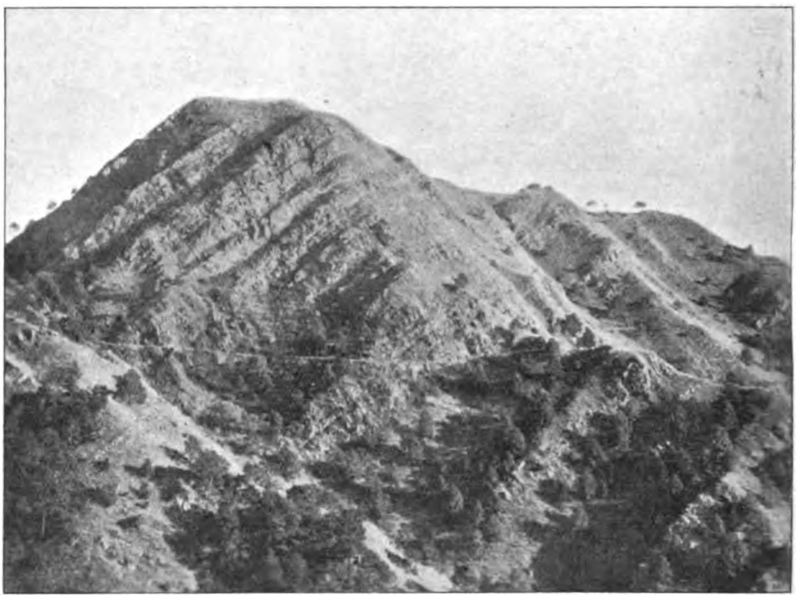

Fig. 6.—Tapp's Nose, Kasauli.

but showing up crystal clear in these upper regions; the whole presenting a panoramic picture which can scarcely be surpassed, if equalled, from any other view-point in the world.

I have visited several Indian hill stations in my time and each possesses its own beauties and attractions. Thus, the Nilgherries to the south with their equable climate, exuberant and varied vegetation, and glorious groves of blue gums and mimosa, are probably unique in their way, and their immediate surroundings and vistas are far more beautiful than are to be found in the vicinity of Kasauli; but Dodabetta (8,640 feet) is their highest peak, and one misses the snow-capped monsters of the northern range, nor are the distant views to be compared either in variety or grandeur with those obtainable in the Himalayas.

The special charm of Kasauli, apart from the glorious show of semi-wild dahlias during the "rains" and the cherry blossom in the autumn, is undoubtedly in these marvellously contrasting views. Let us imagine ourselves perched on some commanding view-point such as the summit of "Tapp's Nose" on a clear day, and what do we see?

To the south stretch the scorching and apparently limitless plains intersected by numerous river beds[1] zigzagging out from the foot hills and meandering more or less at right angles to the general line of the Himalayas eventually to join the Jumna or mighty Sutlej, the latter of which may be seen pursuing its tortuous course far away to the westward. In the middle distance, separated from the Himalayan range by a narrow strip of plain lies the picturesque and low-lying range of Siwaliks[2], compared with which the mighty Himalayas are but a mushroom growth.

Immediately below Kasauli lies Kalka, picturesque at this distance, from which on a clear day the rail and cart roads may be seen worming their respective ways, first through a large gap in the Siwaliks, later crossing the Ghuggar River, and finally losing themselves in the mist well on the way to Ambala, some forty miles distant, which is itself discernible, so it is said, on a clear day.

Now let us turn to the north, where lies the grand Himalayan "tumble" of snow-clad peaks, separated from Kasauli and the plains by many intervening ranges of moderate elevation, on the more prominent of which may be seen perched the neighbouring hill stations with here and there a half ruined Gurkha fort to keep us in touch with history.

Amongst the nearest of the hill stations, at a considerably lower elevation than Kasauli and some eight miles distant, lies Subathu, which looks extremely picturesque straggled out along the crest of a saddle-shaped hill, at one end of which, standing out high above the rest of the station on a small knoll, like an eagle in its eerie, is the British military hospital. Away to the north-east, beyond Dagshai lies the Chor Hill (12,000 feet), nearly the height of Mont Blanc, "but a minnow amongst whales" in this district. This hill, which is situated on the direct route between Simla and Mussorie, is snow-capped from the end of November, and is indeed the only member of the nearer hills which retains its snowy cap during the entire winter.

Simla[3] lying between the military station of Jutogh and the fir-clad Jakko immortalized by Kipling is, on many of these clear mornings, so distinct that individual houses can be picked out with the unaided eye and

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[1] It is only during the monsoon and then only immediately after a heavy spate that these rivulets contain any quantity of water; at other times, especially during the autumn and winter months, the bright buff of these dry river beds contrasts vividly with the surrounding green of the cultivated areas through which they run.

[2] The Siwaliks, although now dwarfed by their neighbours, belong to a much earlier geological period than the Himalayas.

[3] Simla is nearly twenty miles from Kasauli as the crow flies.

the tall wireless masts at Jutogh are plainly visible: in the evening when the slanting rays of the setting sun are caught up and reflected back from its innumerable windows the summer capital resembles some fairy city or a gleaming diamond casket in a magnificent setting of dark green forest trees.

During and after the rains some of the sunsets viewed across the plains are superb, and the occasional soft peach-coloured "after glow" spreading over the mountains, as the sun sinks below the horizon, is as beautiful to look upon as it must be difficult to transfer to canvas.

A curious atmospheric phenomenon known locally as the "winter line" is to be seen on clear evenings during these winter months; this consists of a greyish or neutral-coloured band with a very definite upper border stretching immediately above the true horizon east and west as far as the eye can see. The sun as it approaches the true horizon first appears to sink into this winter line which only partially obscures it, and, finally, as the orb sinks lower below the horizon, the neutral tinted band of the winter line is lit up from behind and takes on the most delicate roseate tint, or may even on occasion approach a fiery red in colour, a unique and never-to-be-forgotten sight.

Flora.

In addition to the ubiquitous cheer pine (*Pinus longifolia*),[1] horse chestnuts, deodars, and white oaks are amongst a variety of trees which grow in moderate profusion in and about Kasauli.

A few spruce firs and blue gums are also to be seen; the latter do not take kindly to the trying climate of these Himalayan slopes and the few examples that exist are but poor specimens, not to be compared with the giants that grow so luxuriantly, although comparatively recent importations, in the Nilgherries near Ootacamund.

One of the finest trees in Kasauli is a magnificent deodar which stands above and partially ruins by its shade the fine tennis courts of the Kasauli club. This tree, which reminds me strangely of the sacred umbrella tree[2] near "Ooty," is somewhat of a familiar friend to the old residents of Kasauli, who rise up in their wroth when the destruction of their "mascot" is mooted by the "migrant vandals" from the plains with a view to improving the amenities of the courts.

The bright-hued rhododendron so common in the Simla district is unfortunately not seen at Kasauli, its place being taken by the purple flowered bougainvillea and lagerstroemia, nor, I believe, is the wild orchid found on these lower slopes.

Amongst the smaller fry, the little wild zinnias peep out on every side, and the glorious many-hued semi-wild dahlias, recent importations I am

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[1] The better grown blue pine (*Pinus excelsa*) only grows at higher altitudes.

[2] The umbrella tree at Ootacamund is connected, in some way, with the religious rites of the Rodas, an interesting hill tribe, confined to the Nilgherries.

told, though none the less beautiful for that, have received notice in a previous section.

There is one striking phenomenon peculiar to the lower Himalayan slopes which cannot fail to be remarked by even the most unobservant eye. This consists of the very remarkable contrast that exists between the thickly wooded slopes with a north and north-easterly aspect, covered as they are with a riot of exuberant vegetation, and those looking towards the south and south-west, which are seen to be but sparsely clothed with stunted trees or prickly euphorbia, uncovered bluffs of rock and arid scarps being much in evidence.

Sir Edward Buck [1] has thus explained this curious phenomenon:—

"For observe the northern and north-easterly slopes are covered with a profusion of vegetation of all kinds, while the southern and especially those which trend westward are almost bare . . .

"If I may attempt an explanation of so striking a phenomenon, it would be this: young plants and seedlings are, on the southern slopes thwarted in their first attempts to live by the piercing heat of the unclouded sun, aided by the hot blast of the desert winds from the western Punjab and Rajputana. When, therefore, the tremendous downpour of the monsoon torrents beats upon the hill sides, there is no shelter of vegetation, no protecting tangle of matted roots to hold up the soil, and therefore so much the less chance is there, when the next summer returns with hot dry winds and baking sun, for seeds to germinate or tender plants to live. There is a constant tendency to denudation, which results in bareness. The northern and north-easterly slopes, on the contrary, turning away from the mid-day sun are in shade, and are protected also by their aspect from the direct blast of the desert winds, while they are refreshed occasionally by moist and cool breezes from the snows. Young plants can live. A mass of roots and herbage holds up the soil and jealously guards it against the precipitous rush of the monsoon, while leaves and grasses add, year after year, to the depth of rich humus. There is a constant tendency to the formation of soil, which results in a clothing of vegetation. . . ."

If this be the only explanation I know not, but the fact remains, and the contrast is there.

Fauna.

One of the chief delights of the wonderful autumn season to a casual visitor like myself with no stake in the land, but viewed with quite different feelings by the local ryots, is afforded by the hordes of great lungour monkeys and their progeny which come trooping down to Kasauli directly the summer visitors have gone and the cherry trees are in full blossom, for lungours love the sweet cherry blossom and will strip a tree in very short time. They are somewhat shy and suspicious and not nearly

[1] Lecture to Bombay Natural History Society, quoted in "Simla Past and Present."

so tame or bold as the common brown monkey, but they will, on occasions, approach quite sufficiently near for one to be able to watch their antics at comparatively close range. There can be few more entertaining sights than to sit quietly and watch ma, pa, and baby monkey amusing themselves on a neighbouring tree or basking in the sun, their arms entwined in the most affectionate manner.

The lungour apparently makes an excellent mother and there is something almost human (or more than human) in the care she bestows on her young; she may often be seen sitting by the hour together fondling one of her progeny, slapping it playfully on the face or head, or performing the kindly act of picking out some of the numerous ectoparasites with which monkeys are infested. When on the move they carry their very young hunched on their backs or slung to the under aspects of their bodies, the latter, one would think, somewhat uncomfortable for both. The wonderful precision with which a huge lungour will leap from branch to branch or from tree to tree, often covering a surprising distance in the leap, is little short of uncanny, and the noise made by two or three big fellows jumping about on the tin roof of one's bungalow is deafening and also rather terrifying in the sma' wee hours of the morning before one has collected one's wits. Lessons in the essential art of accurate leaping appear to commence at an early age, and it is rarely indeed that one sees even the tiniest "banda" make a false step (or leap).

Whilst the older "grey beards" are somewhat staid and may be seen by the hour together sitting on their "hunkers" chewing the cud of reflection, when not feeding, the younger members of the family are most playful and are constantly on the move gambolling or quarrelling amongst themselves. Some of the impromptu boxing and wrestling matches between the young "bloods" are most entertaining and they frequently show considerable skill in the gentle art of fisticuffs.

At one time a cohort of lungours took a fancy to the family hospital and many dozens could be seen playing and fighting in the trees in the near vicinity or on the sunlit path in front of the verandah. The hospital sisters were in a constant state of terror lest one of them should run off with one of the infants lying in its cot on the verandah; what a commotion there would be!

On one occasion we were feeding a monkey (a brown monkey, for I have never seen the hill lungour approach sufficiently close to be fed in this way) with one of our cherished Kulu apples from the back verandah; on returning to the dining room to replenish our stock we were chagrined to find the platter bare, the artful bandas having taken the golden opportunity to jump in at the front window and make a clean sweep, while we were feeding their "decoy" at the back.

Monkeys are not our only animal visitants at Kasauli. During the past year panthers have been unusually bold and numerous, and on more than one occasion a lady has arrived at the club in an almost fainting condition,

her dog or young pup having been made off with, and on one occasion actually grabbed at while on the lead, by Mr. "Spots."

Jackal are often to be heard and seen towards the evening, and hyenas prey on the village clearings round about. Some of the worst cases admitted to the cantonment hospital are the results of hyena's bite or panther's claw, the former inflicting terrible and very septic wounds.

There is, of course, an endless variety of bird life to be seen and heard, for many of the hill birds are fine songsters, on these Himalayan slopes. Many of our friends from the plains can be recognized, as well as a host of others only met with in these higher and cooler altitudes. The ubiquitous bulbul, cheery myna, cawing crow and soaring kite, are much in evidence, but considerably sturdier and in better "feather" than their prototypes of the plains.

The crow, for example, is a large and very venturesome fellow, glossy jet-black in colour, like well-polished black boots, and without the greyish "coatee" worn by his brother of the plains; some of the kites, too, are immense, with a tremendous wing-spread, and appear in their element gliding from crag to crag or from hill top to hill top with hardly a quiver of their wings in a nonchalant manner, which must strike envy into the heart of any flying-man.

Whilst scarcely a shikari's paradise there is a fair amount of "scatter gun" shooting to be had in the neighbourhood, although, unfortunately, most of the best shooting in the adjoining Native States is very strictly preserved. Pea-fowl, black and common hill partridge, pheasant, jungle fowl and an occasional woodcock may all be shot near at hand, and amongst larger game gurral (common) and barking deer (rare, but delicious eating) are to be found.

Panther parties were a feature last season, but with very limited success.

Motor Trips.

The motoring possibilities in the district are somewhat limited. There is a delightful 20-mile run to Subathu by a fairly good though narrow and twisting road which coasts along one side of a very picturesque valley; Dagshai is only 10 miles away just off the main Kalka-Simla road, the final 2 miles of this run are very steep and the road surface treacherous.

The fifty-mile drive to Simla itself is a very pretty and easy run, and the road well-graded, although liable to produce hill sickness in those with a tendency that way; some of the views along this road, especially as one approaches the summer capital, are very beautiful.

Ambala is an easy run of sixty miles. For the first twenty-two miles one descends the hill by a series of easy curves and hair-pin turns to Kalka; four miles further on lie the beautiful old Mughal gardens of Pinjor, which owing to the care bestowed on them by the Maharajah of Patiala, in whose State they lie, retain much of their ancient glory. An interesting legend attaches to these gardens; they were built by Fadai Khan, foster brother

of the famous Mughal Emperor, Aurangzeb, one of the few "Omrahs" of the Mughal Court whom this bigoted and intolerant monarch really favoured. Fadai, at the time Governor of this district, with the artistic instinct of his age, "planned a great terraced garden, so situated as to embrace 'wide views over the woodlands to the plains beyond . . . ,'" and right well did he achieve his object. "A quaint story still survives, how, when at length the work was finished and Fadai came in state to spend his first summer there, his enjoyment of the garden and its beauties was short-lived: for the Rajas quickly frightened him away. In the districts round Pinjor, and in fact all along the foot of the Himalayas occasional cases of goitre are to be seen; so from far and wide these poor

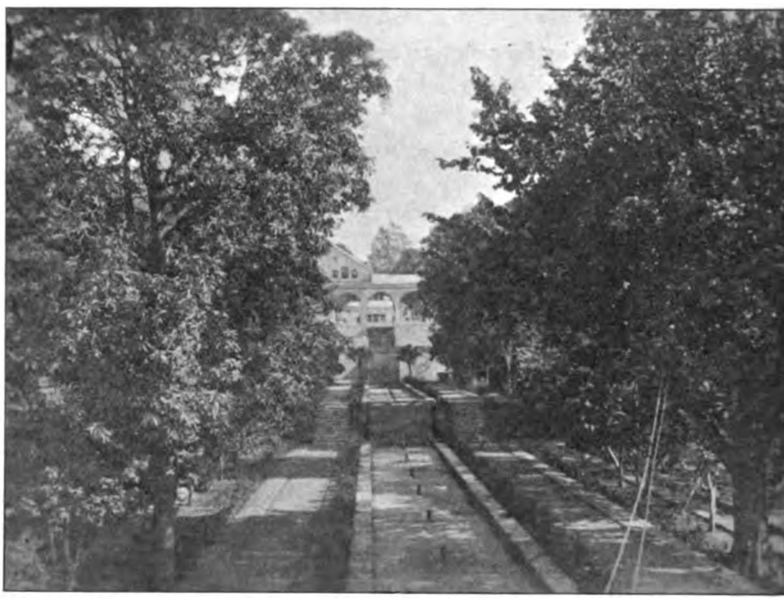

Fig. 7.—Pinjor Gardens. The wide central canal, slopes for artificial cascades and small central fountains are well seen.

people were collected by the wily Brahmins and produced as ordinary inhabitants of the place. The gardeners all suffered from goitre; every coolie had this dreadful complaint; even the country women carrying up the big flat baskets of fruits and flowers to the zenana terraces were equally disfigured. The ladies of the harem naturally were horrified; it was bad enough to be brought into these wild outlandish jungles, without this new and added terror. For the poor coolie woman, well instructed beforehand, had told how the air and water of Pinjor caused this disease which no one who lived there long ever escaped. A panic reigned in the zenana; its inmates implored to be removed at once from such a danger, and finally, Fadai Khan had to give way and take his ladies to some other place less

threatening to their beauty. Had it been the terrible Emperor himself instead of his foster-brother, the cunning Rajas would have met their match. But Fadai Khan, thoroughly deceived, rarely came back to visit his lovely gardens, and the Rajas and their fields were left in peace for a time."[1]

The ancient water system, a great feature of all Mughal gardens, has been well preserved, and the authorities will, if given notice, cause the feeding tanks to be filled, so that, with the limpid water running along the wide canals,[2] dashing down the artificial cascades, and thrown up by the numerous fountains, one may obtain some idea of what an ancient Mughal garden is like.

The Maharajah also utilizes the gardens as a pheasantry, and the hundreds of handsome English pheasants, which may be seen running wild within its walls, add to the charm of an already beautiful retreat, besides making one feel quite home-sick. The neighbourhood of Pinjor, originally Panchpura, the town of five, has far older historical associations than this, for the Pandavas, the five sons of Panda, lived in the neighbourhood of this village during their period of voluntary concealment before the first of the historical battles of Panipat was fought.

Some few miles further on one crosses the Ghugar river over a great wire net thrown across its bed; while usually fordable, during the monsoon spates one may be held up for hours on the banks of this monsoon torrent, or be forced to make a precarious crossing by ferry.

At Ambala one meets the grand trunk road, the best motor road I have ever been on, and an absolute paradise for the "speed hog," where "bhail gharries," not policemen, are his only enemies.

A Study in Contrasts.

I have attempted throughout this article to indicate some of the vivid contrasts for which Kasauli, to my mind, is so remarkable.

The scorching plans and snow-clad peaks both visible from the same view-point.

The mighty Himalayas and the age-old stunted Siwaliks.

The arid and sparsely-covered southerly slopes and the well-covered slopes facing the north and north-east with their riotous vegetation and well-cultivated terraces.

The remarkable succession of seasons each with its clear-cut climatic conditions.

These are surely enough to justify my title, but there is still another contrast, common indeed to all hill stations, on which I have not yet touched.

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[1] "Gardens of the Great Mughals," C. M. Villiers-Stuart.

[2] These old Mughal gardens may be to some extent "dated" by the width of the cana running down their centre. The earlier examples are narrow, those built at a later date, of which Pinjor is one, have a comparatively wide central canal.

During the summer months Kasauli is, like most other hill stations, a seething mass of humanity; the barracks are full to overflowing; every bungalow is crowded and overcrowded; the usual unceasing round of social activities takes place; the Club resembles a swarm of bees; the tennis courts, some of the finest in Northern India, are in constant demand, and tournament follows tournament.

The autumn comes. The summer visitors depart to their plain stations, deserted are the tennis courts.

The Club moves into "winter quarters," shutting down half its accommodation; the hospital, and especially the family hospital, thriving concerns during the summer months, remain practically empty, and the familiar walks are given over to birds and lungours. The bazaar is now a mournful concern, with more than half its shops shut and the other half containing but the bare necessities of life. Then do the permanent residents, staid and "solid" folk, most of them, who have little in common with the frivolous and laughter-loving summer migrants, come out of their shells, and the one common room in the Club "rings" to the tune of their dancing knitting-needles.

REFERENCES.

In writing this article I have made free use of the very interesting volume, "Simla Past and Present," by E. J. Buck. My description of Pinjor is based on the fascinating chapter on Pinjor in "Gardens of the Great Mughals," by C. M. Villiers-Stuart.

The Mutiny references are are abstracted from a series of letters and notes collected in an old book of church records; while much information has been obtained from a "Hand-Book to Kasauli." Finally, the residents of Kasauli, who, I trust, will take my friendly "badinage" in good part, have, consciously or unconsciously, contributed their quota.

Current Literature.

LOEWENSTEIN, E. Neue Wege der Diphtherie-prophylaxe. **[New Methods of Prophylaxis against Diphtheria.]** *Deut. med. Woch.* 1929, v. 55, 53-5. [9 refs.] [State Serotherap. Inst., Vienna.]

In place of subcutaneous injections of toxin-antitoxin or anatoxin, which are liable to give rise to severe local reactions, Loewenstein has recently substituted inunction of the skin with whole, unfiltered cultures of diphtheria bacilli rendered non-toxic by formalin. The inunctions did not cause any local or general reaction.

Children who had hitherto been Schick-positive became negative after a single application in 8 per cent., after two applications in 32 per cent., and after three applications in 67 per cent., while only 28 per cent. remained positive.

The author's experience is at present not sufficient to enable him to say whether the children in whom the Schick reaction has become negative are really protected against diphtheria, but the results hitherto obtained are very encouraging.

The method is so harmless and so easy to carry out that it deserves further trial on a more extensive scale.

J. D. ROLLESTON.

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COMMONWEALTH OF AUSTRALIA. **Report of the Royal Commission of Inquiry into Fatalities at Bundaberg, together with Appendices.** 125 pp. 1 map, 3 figs., 1 graph & 14 charts. [2s. 9d.] [KELLAWAY, C. H., MACCALLUM, P., TEBBUTT, A. H.] Also in *M. J. Australia.* 1928, v. 2, 2—30; 38—52 & 58—85.

The complete text of this report is given and it appears that from January 17th to 27th, 1928, thirty-one children received prophylactic injections from a 10 cc. rubber-capped bottle of toxin-antitoxin prepared in the Commonwealth Serum Laboratories. On January 27th, 13 children received their first injection of 2 minims and 8 children their second injection of 4 minims of the antigen, and of these 21 children, 18 became ill with symptoms of significant similarity during the night of January 27th or the early morning of January 28th, and 11 died on the latter date and one on January 29th. In all except 2 cases the symptoms developed in 5 to 8 hours and the brief illness was characterized by vomiting, diarrhœa, pyrexia, collapse, pallor, deep blotchy cyanosis, coma and convulsions. Of the survivors all had one feature in common, namely, abscesses at the site of inoculation, from which in 5 cases pure cultures of a staphylococcus were isolated. The post-mortem examinations were unfortunately not performed, except in one instance, by a trained pathologist, and the evidence thereby obtained was not conclusive but the findings confirmed the unity of the cause. Possible causes such as food poisoning, acute gastro-intestinal infection, heavy metal poisoning or other acute disease unrelated to the injection could be ruled out with almost complete certainty, and careful consideration of the clinical features, the results of other accidents traced to the administration of free diphtheria toxin, and the various stages of the preparation of the mixture in the laboratory led the Commission to the view that the dissociation of toxin from the mixture played no part in causing the illnesses and deaths. Tetanus, anaphylaxis and allergy could also be dismissed. The remaining contents of the bottle from which the fatal doses had been withdrawn were bacteriologically examined, and apart from a yeast which failed to grow, the only other organism isolated was a staphylococcus which was found to be identical with staphylococci isolated in pure culture from the abscesses at the site of injection of five of the survivors. The pathogenicity of this organism is discussed at some

length and the Commission are of opinion that the deaths were caused by the injection of living staphylococci in the toxin-antitoxin mixture. This conclusion rests partly on negative evidence, no rigid proof being possible. The method of contamination of the toxin-antitoxin mixture was investigated, and while it was not possible to say whether the contamination occurred during the withdrawal of the antigen from the bottle at which time a certain amount of air possibly containing organisms would be admitted, or whether the sterile water in which the needles were immersed was contaminated by the physician's fingers as he picked the needles out, the Commission are inclined to the latter explanation. It is stated that the operator's hands were thoroughly scrubbed in soap and water. The mixture as issued was sterile but contained no antiseptic, this omission being intended to safeguard against the dangers attendant on freezing, and further the rubber-capped bottle was accompanied by no information as to the presence or absence of antiseptic. Certain recommendations based on the information derived from the inquiry are made. Biological preparations in which the growth of pathogenic organisms is possible should not be issued in rubber-capped containers for repeated use unless antiseptic has been added. The containers of biological products not containing antiseptic should bear a conspicuous printed notice stating that antiseptic is absent, they should be used immediately on opening, and any surplus discarded. Biological products should be distributed in clear glass containers so that turbidity may be detected. The advisability of substituting anatoxin or some similar immunizing agent for toxin-antitoxin should be fully and carefully considered, and special post-graduate training should be given to medical men entrusted with mass-immunization work. Fourteen appendices are given and these contain the details of all the evidence submitted to the Commission.

A. JOB.

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LUETTMERDING, A. Influence de l'acidité du milieu sur la formation de la vitamine C. **[Influence of Acidity on the Formation of Vitamin C.]** *C.R. Soc. Biol.* 1929, v. 100, 589-91. [2 refs.]

Previous work having shown the rapid development of vitamin C in cereals and legumes during the soaking of the seeds to bring about germination, the author tested the effect of allowing the seeds to soak in dilute acid. The seeds of wheat, oats and peas were allowed to soak for varying lengths of time in: (*a*) distilled water; (*b*) 0·05 per cent. citric acid; and (*c*) 0·1 per cent. citric acid. The seeds were then fed (20-30 gm.) to guineapigs on a diet otherwise free from vitamin C. With wheat, the grains soaked in water did not contain sufficient vitamin C to maintain life until they had been soaked for 15 hours. The grains of wheat soaked in

0·05 and 0·1 per cent. citric acid contained a sufficient amount of vitamin C after 12 hours' and 6 hours' soaking respectively. With oats, the grains soaked in water for 48 hours did not contain enough vitamin C to maintain life, while the grains soaked in 0·05 and 0·1 per cent. citric acid were capable of maintaining life after 48 hours' and 24 hours' soaking respectively. The development of vitamin C in peas was so rapid that 3 hours' soaking in water sufficed to produce a protective amount. An accelerating action of the acid media was therefore not detected in this case. After reducing the seeds to a powder, the newly formed vitamin C rapidly disappears on prolonging the soaking in water.

DOUGLAS C. HARRISON.

Reprinted from "Bulletin of Hygiene," Vol. 4, No. 9.

Reviews.

TWENTY-FIVE YEARS WITH EARL HAIG. By Serjeant T. Secrett, M.M. London: Jarrolds, 1929. Pp. 288. Eight photographic plates. Price 7s. 6d.

The Haig library grows apace. "Sir Douglas Haig's Command, 1915-18" (Mr. G. A. B. Dewar and Lieutenant-Colonel J. H. Boraston) takes us into the theatre. "G.H.Q." (Sir Frank Fox) sets the stage. "Field-Marshal Earl Haig" (Brigadier-General John Charteris) introduces us to the hero: and, in "Twenty-Five Years with Earl Haig," Serjeant Secrett gives us a glimpse behind the scenes and, as it were, into the great man's own dressing-room. As a rule, intimate sight-seeing of this kind is arranged with the object of titillating the inquisitiveness of the public, especially nowadays. The business is seldom edifying. The glimpse is apt to be fraught with danger to observer and observed alike. The former looks to satisfy his vulgar curiosity; the latter revels in, or resents, this intrusion on his privacy, and is dubbed a snob or a boor accordingly.

However, in "Twenty-Five Years with Earl Haig," the reader is discreetly guided and memory is jealously guarded, for Serjeant Secrett is that rare treasure—a servant to whom his master is a hero.

It has been said that censure is the tax a man pays to the public for being eminent. John Churchill, Duke of Marlborough, Warren Hastings, Wellington, Wolseley, a random selection of famous men who, in greater or lesser measure, had to run the gauntlet of ignorant criticism, bitter invective and baseless aspersion. Time has cleared their motives and actions: their reputations and careers are now firmly established and made safe for posterity's sake; but too often the process has been tardy.

The late Field-Marshal Earl Haig did not escape this penalty of greatness; but his is a remarkable case, inasmuch as the censure was negative, weak-kneed and short-lived. His detractors did not say that he was stupid and callous: they said that he was unimaginative and insensible. They did not shout, "Off with his head!"; they merely threw the "Balfour must go!" kind of squib. So little impression was made by these silly attacks that already they are well-nigh forgotten.

Even at this early date, Haig history is rapidly becoming embellished by a Haig legend which is based on real affection, and on an ever-increasing appreciation of the true worth of its hero; and a statue of the blood and thunder type plunges all classes and creeds into acrimonious controversy. The despairing pundits wring their hands and explain—"But this is Art!" "Art or no Art" answer the infuriated legions—"this is not our Douglas. Away with it!" For—

"No man has come to true greatness who has not felt in some degree that his life belongs to his race, and that what God gives him he gives him for mankind."

"Fame has only the span of a day, they say. But to live in the hearts of the people—that is worth something."

Hence the Haig legend. And be it remembered that there is truth in legend as well as in history.

This latest book, if it does not make history, will at least strengthen the legend. It is not without its literary weaknesses; but its very ingenuousness and patent sincerity are ample compensations for its technical defects; and the author's *apologia* for his departure from Earl Haig's service is as creditable to him as to his master.

"I often saw him afterwards, and arranged his clothes for him when he came to London, and what the Earl thought of me my testimonial is sufficient to show. And it is the Earl's opinion only that I care about."

The Earl's opinion only . . . and a discriminating one it was too. There is a sharp lesson in the story recounted on pages 53 and 54, of the young gentleman who left his manners at home. It is a lesson with a moral for many.

The Field-Marshal's approval of his trusted servant was expanded, ungrudgingly and feelingly, to all who did faithful service under his command; and, with Serjeant Secrett, we may be justifiably proud of our regard for, and loyalty to, our great-hearted leader.

In reading this plain tale, one is reminded of Auguste Dorchain's noble lines:—

> "*Quand le flot nous crachait l'écume de ses rages,*
> *Quand nous sentions courir les frissons de la mort,*
> *Elle ne mentait pas, l'étoile qui, du nord*
> *Exaltait nos espoirs et guidait nos courages.*"

A.

TROPICAL NURSING. By A. L. Gregg, M.A., M.D., M.Ch., D.T.M. and H. London: Cassell and Co. 1929. Pp. x + 199. Price 6s.

A most excellent little manual intended for the instruction of nurses in tropical countries. The various tropical diseases are taken in turn; the requisite information is given regarding causative and clinical manifestations, emphasis being laid on special symptoms which should be looked for and reported to the medical man in charge of the case, and finally, the nursing and care of the patient is described in detail.

The book includes a section on "Technique" wherein the procedures necessary in carrying out such measures as blood-transfusion, bowel lavage, test meals, &c., are given fully.

A most commendable manual, clear, practical and full of common sense, and obviously the work of one who knows his job. It will be of infinite value to the nurse in the tropics, and perhaps the doctor himself may steal a glimpse at it without hurt.

HANDBOOK OF SURGICAL DIAGNOSIS. By Clement E. Shattock, M.D., M.S.(Lond.), F.R.C.S. Edinburgh: E. and S. Livingstone, 1929. Pp. viii + 678. Price 15s.

The author's aim is to present in a practical manner the differential diagnosis of the commoner surgical affections from the point of view of the student or practitioner. A considerable amount of morbid anatomy is included, and the volume is well illustrated with radiograms principally in the sections on bones and joints.

The scheme follows that of the standard textbooks as regards regional surgery.

The sections on diseases of bone and diseases of joints strike one as being particularly clear and useful.

Chronic appendicitis is somewhat cursorily dismissed in a little over a page, and the author does not quite give the ways and means of arriving at a diagnosis in this often extremely difficult condition.

On the whole there is a very great deal of useful information, clearly set out, which should be of great assistance to candidates for final and higher examinations and as a book of reference for others. J. M. W.

THE TREATMENT OF FRACTURES AND DISLOCATIONS IN GENERAL PRACTICE. By C. Max Page and W. Rowley Bristow. Oxford University Press. 1929. Pp. xiii + 284. Price 14s.

The second edition of this most excellent volume contains some alterations in the text, also the addition of line drawings. The treatment of the commoner dislocations has now been included in this edition.

The volume is well illustrated with radiograms and diagrams. It is easy to read, clear and concise, and can be confidently recommended both from the point of view of candidates for examinations, and also as an extremely valuable book of reference for the general surgeons. J. M. W.

KER'S INFECTIOUS DISEASES: A Practical Textbook. Revised by Claude Rundle, O.B.E., M.D. Third Edition. London: Milford, Oxford Medical Press. 1929. Demy 8vo, pp. xii + 614; 67 figs., 32 plates. Price 30s. net.

During the nine years that have elapsed since the last edition of this work was published, the investigations that have been carried out on the subject of infectious diseases have resulted in such an advance of knowledge, especially as regards scarlet fever, measles and diphtheria, that a new edition was imperative if the work were to retain its place as one of our best textbooks on the subject.

Dr. Rundle has succeeded in the task of bringing the work up to date without losing any of the characteristic features of the earlier editions. The descriptions of the various diseases are admirable and the points in differential diagnoses as helpful as one could wish for. The technique of the newer methods used in diagnosis and prophylaxis is explained fully in simple detail.

It is probable that the advocacy of alcohol as a stimulant and tonic in such diseases as diphtheria and smallpox may meet with opposition, seeing that its use in most hospitals has practically ceased, but the author is to be complimented on having the courage to maintain the conviction he has formed from his wide experience in treatment.

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C.N. = Clinical and other Notes.
C.L. = Current Literature.

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